FOREST INSURANCE

by

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FOREWORD

Standing timber is one of the few important kinds of property that are not generally covered by insurance. Studies made by the Forest Service and other agencies have indicated that the risks involved in the insurance of timber are not unduly great, provided they can be properly distributed. Such studies, however, have thus far failed to induce any notable development of forest insurance.

This report, prepared by Ellis T. Williams, summarizes the progress in this field to date and gives a broad picture of the difficulties and opportunities inherent in this important, but as yet relatively undeveloped, part of the forest economy. Written primarily from the insurance viewpoint, it adds something new to the literature on forest insurance.

Because of the interest of foresters and forest owners in this subject, the Northeastern Forest Experiment Station has encouraged the author in this study and has advised him in some of the forestry aspects of the problem. The Station is distributing this report to make it generally available to interested individuals and agencies.

W. L. Hafley

Director
Northeastern Forest Experiment Station

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FOREST INSURANCE[1]

by

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"Forest insurance should be brought within the economic reach of the average forest land owner ... The subject has received considerable study. It requires much additional consideration."
—UNITED STATES FOREST SERVICE (84)[2]

INTRODUCTION

A discussion of forest insurance in the United States must start with the plain fact that the amount of coverage, either placed in the past or now in effect, is negligible. Indeed, at first glance the subject might seem to resemble that selected by the schoolboy for his composition on "The Snakes Of Ireland". His composition consisted of the single statement: "There aren't any."

However, it is obvious even upon slight acquaintance that forest insurance cannot be dismissed so casually as that. Upon closer examination the subject is seen to contain numerous perplexing and interesting problems that have thus far escaped satisfactory solution in this country.

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[1]The material presented in this report is based on a thesis submitted in partial fulfillment of the requirements for fellowship in the Insurance Institute of America, Inc.

[2]Numbers in parentheses refer to Literature Cited, p. 73.

Although relatively new to the United States, the insurance of standing timber has had a long history abroad. In Europe, practical experience with forest insurance goes back at least to 1870 (2); and in more recent years forest insurance has become an accepted and successful form of underwriting in the Scandinavian countries (18) and to a lesser extent elsewhere. In this country, the subject has continued to arouse interest over a period of 30 years, even though rarely reaching the stage of practical application.

Forest insurance seems to have first attracted serious attention in the United States in 1917 with the formation in New Hampshire of the Timberlands Mutual Fire Insurance Company, stated to have been the only organization in this country that dealt exclusively in timberland insurance (17, p. 10). The company had only a brief existence, but interest in forest insurance by no means came to an end.

In 1919 Henry S. Graves, Chief Forester of the United States, recommended a number of specific aids to private timber owners, including the encouragement of forest insurance (40). He pointed out that fire insurance becomes feasible when forest property becomes secure under protection. In the same year, Gifford Pinchot, former Chief Forester, recommended Federal action authorizing the establishment of adequate forest-insurance agencies as a factor in stabilizing the lumber industry and in encouraging improved forest-fire protection (59).

In 1920 the Society of American Foresters considered forest insurance and recommended setting up an actuarial bureau to collect forest-fire statistics and promulgate rates with the idea that this might develop into a Federal forest-insurance organization (65).

In 1923 the Home Insurance Company offered insurance (17, p. 11) on merchantable standing timber and later extended its facilities to include plantations.[3] That same year a Senate Select Committee on Reforestation considered a plan for combined Federal and State forest insurance (42).

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[3] Trees planted by hand as distinguished from second growth that has come in from seeding without personal supervision and planting.

In 1924 the Clarke-McNary Act provided for investigation and promotion by the Department of Agriculture of "practical methods of insuring standing timber on growing forests from losses by fire and other causes" (73). Three years later a committee set up by the United States Chamber of Commerce submitted a carefully prepared report on forest insurance (66).

In 1928 appeared a study of forest-insurance possibilities in Michigan (44) and 5 years later one by the Harvard Forest on conditions in Massachusetts (17). In 1935 the Fletcher Bill proposed to set up in the Farm Credit Administration a Forest Credit Bank with a capital of $40 million, of which $10 million was to be set aside as an insurance fund (84). In 1937 and 1939 were issued reports on two studies of forest insurance, one for the Pacific Coast States (62) and one for the Northeastern States (64). These were prepared by the United States Forest Service under the provision of the Clarke-McNary Act, and they represent the high-water mark in the study of the subject to date. In 1941 the Bankhead Bill (20), embodying the findings of a Joint Committee on Forestry appointed by the 75th Congress (74), proposed another forest credit bank, this time with an insurance fund of $7½ million.

During World War II, the War Damage Corporation wrote insurance on standing timber (10). In 1944 legislation was passed to permit the Federal Crop Insurance Corporation to write timber insurance on an experimental basis (75) while the Hook Bill, introduced in 1946 and endorsed by the International Woodworkers of America, Congress of Industrial Organizations, proposed full-scale forest underwriting by the same agency (49). Finally, in the fall of 1946 at the American Forest Congress, sponsored by the American Forestry Association, the need for forest insurance was emphasized by business and conservation interests as well as by the Government (16).

Although it is not claimed that the foregoing is in any sense a complete catalogue of the development of forest-insurance thinking in this country, it does indicate continuing interest in the subject during the past three decades. This interest is the more significant in that it has stemmed from as widely different sources as timber owners, professional foresters, insurance underwriters, conservationists, the Federal Government, and organized labor.

Reasons for renewed study of the subject at this time are threefold. In the first place, forest insurance is an unsolved problem; and if timber owners need this form of protection, ways of providing it

must continue to receive attention. Insurance, that is to say, the application of the law of large numbers in such a way as to bring about the elimination of risk through the redistribution of loss, is a social device that has been applied to an ever-widening range of economic problems. It is the purpose of this study to discover whether loss by forest fire is, in fact, susceptible of insurance treatment under existing conditions.

In the second place, it would seem that the underlying requirements for successful timber insurance are steadily becoming more favorable. The fact that forest insurance has not taken hold in the past is thus no indication that it may not be able to do so in the future. On the one hand, improved measures of protection are reducing the fire loss and so making it easier for underwriters to supply this form of protection. On the other hand, gradual exhaustion of the timber supply is placing more emphasis upon growing timber crops as a commercial enterprise, and so it is increasing the demand for insurance protection.

The third reason for the study lies in the need for a brief summary of the field to give the insurance reader an up-to-date picture of the problems, difficulties, and opportunities involved. That forestry and government circles have in the past given forest insurance more attention than the insurance business has is hardly open to question. It is the hope of the writer that this study will help to focus the interest of fire underwriters on the problem in order that they may determine how much of a contribution they can make to its solution. Since it is well to acknowledge a bias frankly, rather than to leave it for the reader to infer, it can be stated without reservation that the writer believes the practical experience and know-how of the commercial underwriter is needed if forest insurance is to move ahead.

A number of basic questions have been formulated as a means of gaining a well-rounded view of the subject. These questions are as follows:

1. Is there a real need for forest insurance?

2. Why has forest insurance made so little progress in this country?

3. Do former obstacles still exist?; and, if so, to what extent can they be removed?

4. Is standing timber an insurable risk under existing conditions?

5. What type of carrier is best suited to undertake forest insurance?

6. What practical steps can be taken to place forest insurance on a working basis?

In the discussion that follows, fire insurance receives primary consideration while coverage for loss by other perils and all-risk insurance are mentioned only incidentally. There is little doubt that coverage of additional perils and all-risk coverage, however desirable, must wait until fire insurance has been thoroughly worked out and a satisfactory rate base tested through actual underwriting experience.

In this study the insurance reader has been kept constantly in mind. Those who have followed the discussions of timber insurance in forestry literature through the years will find little that is new to them. The objective has been a general survey of the field as a whole rather than an actuarial analysis of a particular region.

CONSIDERATIONS OF DEMAND

THE BASIC NEED

In the broad question of demand, consider first the risk itself--the commercial forest resource. While the subject is not a simple one, certain basic information is essential to an understanding of what it is that we are interested in insuring. To the fire underwriter, who is accustomed to covering buildings and their contents, mercantile stocks, and similar classes, standing timber presents some novel and unusual features. A recent writer has stated that

> "Forests are not mines of wood; nor are they storehouses of standing logs. Forests are complex communities of living and growing organisms. Each organism--each tree species--has its own behaviour pattern. Each kind of tree, be it pine, spruce, cypress, oak or maple thrives in its own peculiar set of conditions--as to soil, light, heat, and water" (24, p. 17).

While the underwriter need not concern himself with the technical problems of the forester, he must have some knowledge of the quantity and composition of the forest stand, of its regional distribution, and its pattern of ownership. A series of reports issued as parts of a United States Forest Service reappraisal of the Nation's forest situation, undertaken during 1945 and 1946, has recently become available and is helpful in this connection.

The Commercial Forest Resource

The commercial forest land area in the United States amounts to some 461 million acres, roughly one-fourth of the land area of the country. The ownership of this commercial forest area is shown in table 1. While these figures indicate the situation throughout the Nation as a whole, there are naturally important regional differences due in part to relatively larger Federal holdings in the form of National forests and other lands in the Western States. It is apparent from table 1 that the privately owned forest land, to which the underwriter would have to look for business, constitutes the bulk of the commercial timber area. These privately owned forests have a value

Table 1.--Ownership of commercial forest land in the United States, 1945

Ownership	Acreage	
	Thousand acres	Per-cent
Public:		
Federal	88,957	19
State, county, municipal	27,114	6
All public	116,071	25
Private:		
Farm	139,058	30
Industrial and other	205,915	45
All private	344,973	75
Total	461,044	100

Source: U. S. Forest Service (78).

Table 2.--Commercial forest area of the United States, by character of growth, 1945

Type of growth	Acreage	
	Thousand acres	Per-cent
Saw-timber area:		
Virgin growth	44,618	10
Second growth	160,558	35
All saw-timber areas	205,176	45
Pole-timber area	95,013	21
Seedling and sapling area	85,552	18
Other, including denuded	75,303	16
Total	461,044	100

Source: U. S. Forest Service (78).

estimated at more than 4 billion dollars (33).

The composition of the commercial timber area by type of growth is shown in table 2. Here again, marked differences by region must be borne in mind.

The terms used in table 2 need some explanation. They are based upon the size of tree (measured by the diameter $4\frac{1}{2}$ feet above the ground, known as "diameter, breast height" and abbreviated "d.b.h.") and volume per acre, rather than upon the use to which the timber is actually put.

Thus "saw-timber areas" are characterized by timber large enough for sawlogs (lumber or veneer) and in sufficient volume per acre for economic operation. "Virgin saw-timber" refers to mature forests not seriously disturbed by fire, insects, or disease, and which are characterized by absence of appreciable net growth. "Second-growth saw-timber" areas, on the other

hand, are those not qualifying as virgin stands and on which net growth does occur. "Pole-timber" areas are characterized by trees too small for lumber but large enough for cordwood (5 inches d.b.h. and larger). The remaining classes refer to areas with young growth or which are poorly stocked. Problems of forest underwriting naturally differ as respects susceptibility to fire, valuation, loss adjustment, salvage, and in other ways according to the character of the timber growth.

Although the underwriter is interested primarily in the timber as it stands in the woods, an idea of the board-foot[4] volume of lumber that the timber is capable of producing will be helpful in getting an over-all view of the forest resource. Table 3 shows this volume by major forest regions, for both softwoods and hardwoods.

Table 3.--Board-foot volume of saw timber on commercial forest land of the United States, 1945

Section	Softwoods		Hardwoods		Total	
	Million board feet	Per-cent	Million board feet	Per-cent	Million board feet	Per-cent
North	65,836	5	154,593	51	220,429	14
South	193,790	15	144,197	47	337,987	21
West	1,036,751	80	5,805	2	1,042,556	65
Total	1,296,377	100	304,595	100	1,600,972	100

Source: U. S. Forest Service (78).

While such large figures are difficult to grasp, it may be helpful to realize that about 9,000 board feet of lumber are required in building an average six-room house. One billion board feet will therefore provide enough lumber for more than 100,000 houses.

[4]The board-foot unit of lumber measure is equivalent to a board 1 foot square and 1 inch thick.

Reference is made in table 3 to softwoods and hardwoods. These terms refer to the two broad classifications of forest trees--softwoods being the cone-bearing trees (evergreens for the most part) such as the pines, spruce, fir, and hemlock; while the hardwoods are the broadleaf trees (deciduous for the most part) such as beech, birch, maple, oak, hickory, and gum. As shown in table 3, the hardwoods are found chiefly in the North and South, while the softwoods predominate in the West. Hardwoods differ from softwoods in their susceptibility to fire damage, and this is something that must be taken into consideration by the underwriter.

As already indicated, the forest resources are far from uniform throughout the country, and this holds true likewise with respect to fire loss, adequacy of protection, methods of lumbering, and so forth. While information as to forest regions cannot be given here in detail, some comments of a general nature will be useful. The data that follow are taken from Boerker (24).

The Northeastern Region, comprising the New England and Middle Atlantic States, accounts for 13 percent of the commercial forest area but only 5 percent of the saw timber. The principal commercial species are (hardwoods) birch, beech, maple, and oak; and (softwoods) spruce, fir, white and red pine, and hemlock.

The Central Region includes Iowa, Missouri, Illinois, Indiana, and Ohio and accounts for 6 percent of the commercial forest area and 1 percent of the saw-timber volume. Leading species here are (hardwoods) oak, beech, birch, maple, redgum, yellow-poplar, and hickory. In addition there are some softwoods--principally southern yellow pine and cypress. In the Lake Region (Minnesota, Wisconsin, and Michigan) are found 11 percent of the forest area and 3 percent of the saw-timber volume. Principal species are beech, birch, and maple among the hardwoods and hemlock with some spruce, fir and pine among the softwoods. The Southern Region, with 44 percent of the total by area and 22 percent by volume, is composed of the 14 States located south of the three regions previously described. Softwoods predominate, principally southern yellow pine. In addition, oak, gum, poplar, birch, and maple are important among the hardwoods.

The Plains Region, consisting of the tier of States from North Dakota to Texas, is of negligible forest importance. The Columbia River Basin, including Washington, Oregon, Idaho, and part of Montana, accounts for 16 percent of the commercial forest area but contains

50 percent of the saw-timber volume, making it the leading forest area in the United States today. Douglas-fir is the leading species not only of the region but of the country as a whole; it comprises over 27 percent of the National saw-timber stand. Various pines, true firs, spruce, and hemlock are among other important species. The California Region, while containing only 3 percent of commercial forest area, has 12 percent of the saw timber. Many of the species characteristic of the Northwest are found here, and in addition the redwood is important. Finally, the Southern Rocky Mountain Region, which includes Wyoming, Nevada, Utah, Colorado, Arizona, and New Mexico, has 7 percent of the timber resource both by area and by volume. Its leading species are ponderosa pine, spruce, lodgepole pine, Douglas-fir, and the true firs.

The Hazards

The hazards of the forest may be classified under two headings--fire and other. The latter consists of a number of destructive agencies; insects, disease, and windstorm are the most important, but this class also includes such lesser causes of loss as ice storms and damage by domestic and wild animals. With respect to insect infestation, it is estimated that between 300 and 400 types of tree insects cause an annual loss in excess of $100 million (24, p. 160). The gypsy moth, tent caterpillar, and western bark beetles are familiar to us while others bearing such descriptive titles as the white pine weevil, locust borer, spruce budworm, larch sawfly, and hemlock looper are less well known.

Insect damage is of two kinds: endemic, that is, a low level of pest incidence usually present under normal conditions; and epidemic, attacks that may kill entirely one or more species in a particular area (82). Presumably only the latter would be regarded as insurable. "The greatest losses," says Boerker (24), "are not caused by the conspicuous local onslaughts that attract wide attention, but by the sustained annual loss of scattered merchantable timber" over large areas.

It has been pointed out that timber owners frequently fear new and hitherto unknown insects more than those already at work--a factor that makes it difficult for underwriters to calculate the probabilities of loss on the basis of past experience. On the other hand, among favorable underwriting considerations (according to the same source) are the

tendency for insects to restrict their activities to certain species[5] and the increasingly effective measures of plant quarantine. As an underwriting safeguard, Shepard suggests use of a deductible clause (since damage may not become apparent the first season, term policies would be desirable--5 years suggested), together with exclusion of overmature timber, nonnative species, and malformation. Only loss due to death of trees would be covered and not loss resulting from reduction in rate of growth.

Not unlike the hazard of insect damage is that of tree disease. The chestnut blight, white pine blister rust, and dutch elm disease are prominent examples. A recent report of the Forest Service (82) calls attention to the need for intensified insect and disease control and makes specific recommendations to this end. Even though forest entomology and forest pathology do receive increased emphasis, the control of insects and disease is still in its infancy and actuarial data upon which insurance rates could be based are meager.

Windstorm, while not a serious threat under ordinary conditions, can reach catastrophic proportions as it did in the New England hurricane of September 21, 1938, when more than 2½ billion feet of timber were blown down (64, p.1). Approximately one-half the total timber stand in Massachusetts was affected and the net loss after salvage was about 30 percent. Shepard (64) points out that even on the basis of a recurrence only once in every hundred years, a loss of this magnitude could be absorbed at reasonable rates only if spread over the entire country. The lesser forest hazards ought not to prove unduly onerous for the underwriter, and use of a deductible clause should eliminate the smaller losses of this character.

Grouping together losses from hazards other than fire, the Forest Service estimates an average annual commercial timber drain for the 10-year period 1934-43 of 1,019 million cubic feet (78), of which 622 million cubic feet is attributed to insects and disease (82). This compares with an average annual fire loss of 460 million cubic feet over the same period. While preliminary studies have indicated that all-risk forest insurance may not be so difficult of attainment as sometimes supposed,

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[5]For this same reason, however, plantations are especially vulnerable, consisting as they frequently do of large blocks of a single species of tree (76, p. 725).

nevertheless the commercial underwriter will undoubtedly prefer to wait until the fire cover is firmly established before attempting to provide all-risk protection.

The forest hazard of loss by fire is the primary concern. Here must be considered the extent of fire damage, the causes of forest fires, their characteristics, and their effects. These subjects are technical ones and only the more elementary factors involved can be dealt with. The discussion should, however, give the insurance reader some idea of the basic picture and the ways in which it differs from the underwriting conditions with which he is familiar.

Extent Of Fire Hazard

A steady increase has taken place in the acreage protected from fire, growing from 54 percent of the area regarded as needing protection in 1931 to 71 percent of this area in 1945 (table 4). When it is realized that the area protected in 1915 was only 23 percent (76, p.1058) the very substantial progress during the last 30 years becomes readily apparent. It would seem that one may reasonably look forward to a time when virtually all of the nonfederal lands will be under protection as the Federal forest lands now are.

Forest fire protection has been increasing not only in extent but also in effectiveness (table 4, last column). Averages over the five 3-year periods show that the proportion of protected area burned has been 1.37 percent, 0.99 percent, and 0.80 percent, 1.16 percent and 0.95 percent respectively. These figures apply to the country as a whole and represent a composite experience over high- and low-hazard areas. While cyclical variation resulting from climatic and other factors is to be expected, the trend in the burning ratio is encouraging from an underwriting standpoint.

The presence of the Civilian Conservation Corps throughout the forested areas during the years 1933-41, with a record of 6½ million man-days of fire fighting, has been a factor in the improvement shown (24, P. 199). While this source of manpower for actual fire fighting ceased to be available when the corps was discontinued at the outbreak of the war, nevertheless much of the work done by the men, such as construction of roads, trails, bridges, and telephone lines, has continued to influence the efficiency of protection.

Table 4.--Forest acreage needing protection, acreage protected, and acreage burned in the United States, 1931-45[1]

Year	Needing protection	Protected		Protected acreage burned	
	Thousand acres	Thousand acres	Percent	Thousand acres	Percent
1945	429,901	302,942	70.5	2,456	0.81
1944	431,147	301,228	69.9	2,301	.76
1943	430,606	299,331	69.5	3,860	1.29
1942	427,615	290,930	68.0	3,863	1.32
1941	425,815	282,074	66.2	3,138	1.12
1940	428,455	281,706	65.7	2,934	1.04
1939	427,731	278,919	65.2	3,266	1.17
1938	413,591	269,216	65.1	2,148	.80
1937	419,997	258,048	61.4	1,088	.42
1936	427,256	252,254	59.0	2,698	1.07
1935	427,310	242,592	56.8	1,904	.78
1934	426,657	237,377	55.6	2,656	1.12
1933	414,045	220,858	53.3	2,701	1.22
1932	416,519	221,748	53.2	2,692	1.21
1931	420,539	227,578	54.1	3,842	1.69

[1] Figures include both commercial and noncommercial forest areas.

Source: U. S. Forest Service, Washington, D. C. (letter from W. C. Branch, Division of Cooperative Forest Protection, February 5, 1947.)

The 1945 figures of fire damage, broken down by regions, are shown in table 5.

Table 5.--Forest acreage needing protection, acreage protected, acreage burned, and estimated value of damaged timber, by regions, 1945

Region	Needing protection	Protected		Protected acreage burned		Estimated value of damaged timber
	Thousand acres	Thousand acres	Percent	Thousand acres	Percent	Dollars
Eastern	93,610	85,818	91.7	166	0.19	700,391
Southern	180,454	83,967	46.5	1,300	1.55	1,658,154
N.Central	73,216	61,895	84.5	158	.26	291,780
Rocky Mountain	31,751	22,122	69.7	73	.33	131,141
Pacific Coast	50,870	49,140	96.6	758	1.54	1,821,899
Total	429,901	302,942	70.5	2,456	0.81	4,603,365

Source: U. S. Forest Service (77).

There are relatively wide variations between regions, in respect to both percentage of area under protection and percentage of protected area burned. Thus both the Eastern and Pacific Coast regions can claim more than 90 percent protection on State and private lands, while the Southern States have as yet less than 50 percent coverage. Differences are even more apparent in protected area burned. The Eastern States have the best record with a burning ratio of 0.19 percent while for the Southern States the ratio was 1.55 percent. The latter figure reflects the practice prevalent in this section of deliberately burning large woodland areas each year (24, p. 238). The Pacific Coast States experienced an unusually dry season in 1945 and suffered a severe fire in Tillamook County, Oregon, in that year.

It is important to remember not only that the experience of one region differs from that of another, but also that there are marked differences between States in a given region. Thus in the East, Maine, New Hampshire, and Vermont had an average burning rate over the 15-year period 1931-45 (protected areas only) of 0.14 percent and 0.15 percent, and 0.08 percent respectively; while for certain of the less favored

States of the same region the corresponding figure ran over 2 percent. The point is that while the figures show some areas to be definitely not ready for forest insurance, they just as unmistakably show that other areas are ready for it and can produce an experience that will compare favorably with many types of risk with which the underwriter is familiar.

While forest insurance must naturally be "underwritten" as must any type of insurance coverage, it cannot be claimed that forest areas as a whole are so hazardous as to place them outside the pale of insurable risks. By the same token, there is little validity in the argument sometimes heard that the "asbestos" forests of certain areas are so safe that the need for insurance has now passed. The best of protection does not reimburse for loss, and city properties where protection is excellent will doubtless always remain the subject of insurance at a commensurate rate. The question of rate is basic to the development of forest insurance in the United States, and constitutes, as will be shown later, one of the fundamental problems associated with it.

Even though the above figures on the extent of fire damage give some indication of forest fire loss, it is apparent that for insurance purposes they leave much to be desired. An underwriter, accustomed to a ratio of damage sustained to value at risk, finds that a burning ratio based on acreage is difficult to use. While Shepard and others who have studied the insurance aspects of the problem have made conversions to a dollar basis, it would greatly facilitate future rate studies if reliable dollar-value statistics were available. Such dollar estimates of damage that are collected (see final column of table 5) are recognized to be rough approximations only; estimates are not always arrived at by uniform methods in different States and even in a given State may be computed differently from time to time. There is room for real improvement in this respect and the subject has received attention. One example is a study made by the Appalachian Forest Experiment Station in 1941 (21).

Causes Of Forest Fires

Forest fires may be classified as either natural or man-caused. The former, consisting of lightning fires and those caused by spontaneous combustion (listed under miscellaneous), make up not more than 10 percent of the total. At least 90 percent are caused by man.

The numbers of fires from various causes in 1945 are listed in table 6. The standard classifications used in reporting forest fires, and the comments about them, are based on Hawley's discussion of the subject in his book on Forest Protection (41).

Table 6.--Number of forest fires on protected State and private lands in the United States, by cause, 1945

Cause	Region					Total
	Eastern	Southern	North Central	Rocky Mountain	Pacific Coast	
Lightning	89	179	24	482	1001	1775
Railroads	1648	1079	857	210	364	4158
Campers	301	814	141	66	199	1521
Smokers	3158	5084	1120	248	1770	11380
Debris burning	1862	3645	988	107	798	7400
Incendiary	828	12384	588	23	481	14304
Lumbering	50	553	28	27	208	866
Miscellaneous	1555	3487	472	140	1118	6772
Total	9491	27225	4218	1303	5939	48176
Average acres per fire	17.5	47.8	37.4	56.4	127.7	51.0

Source: U. S. Forest Service (77).

Lightning-caused fires include those directly or indirectly attributable to that cause. Railroad fires are those resulting from locomotive sparks or other operations of common carriers (but not logging railroads). Fires caused by campers include all fires, except those due to smoking, resulting from carelessness of campers and travelers in the forest. Smokers' fires are those resulting from smokers' matches or burning tobacco of any kind. Fires resulting from debris burning include those used for clearing land, burning range, or burning rubbish, and which spread to lands other than those of the owner. Incendiary fires are those "willfully or maliciously set by anyone with the intention of burning lands not his own". Lumbering fires include those resulting from the various

lumbering operations, including logging railroads and slash burning. Miscellaneous fires are those that cannot be listed under other headings. Fires of unknown origin are supposed to be listed under the most probable cause and not as "miscellaneous".

In table 6 notice the adverse experience of the Southern States in almost every classification, particularly under the "incendiary" heading. The intentional (but not malicious) burning over of forest lands in this region has already been mentioned. The Eastern States have a relatively large number of smokers' fires, which would be expected in view of the population density of the area. While the total number of fires there (9,491) exceeded that of all other regions except the South, the average area per fire was the smallest (17.5 acres). The North Central and Rocky Mountain regions were low in fires caused by smokers and campers, and low in total number of fires. The Pacific Coast has a relatively large number of fires caused by lightning; the average area per fire of 127.7 acres for this region again reflects in part the Tillamook fire of some 150,000 acres. The figures show the great differences existing between different parts of the country, and they indicate the variations in underwriting approach that will be needed.

Characteristics Of Forest Fires

A distinction is made between ground fires, surface fires, and crown fires. Ground fires are those burning in the humus lying between the soil itself and the undecomposed litter of dead leaves and other vegetable matter on the forest floor. Such fires burn slowly because of limited oxygen supply, but they develop intense heat and may kill all trees affected. Surface fires feed on the forest litter, underbrush, and young growth; and as a rule they affect only the lower portion of the trunks of mature trees. Surface fires are common to all parts of the country. Crown fires occur in softwood stands (conifers) and burn with great intensity and destructiveness, consuming the foliage and killing the trees through overheating of the branches (41, p. 146).

Forest fires may also be classified as to area burned over. In 1945 the regional breakdown from this point of view was as shown in table 7. Some 61 percent of the fires reported were of 10 acres or less in size. If the Southern region is omitted from the calculation, more than 75 percent of fires reported burned 10 acres or less. While occasional conflagrations can do great damage in standing timber, it is an error to suppose that the typical forest fire is one of tremendous proportions, despite popular belief.

Table 7.--Number of fires on protected State and private forest land in the United States, by acreage burned per fire and by region, 1945

Region	Less than ¼ acre		¼ acre to 10 acres		More than 10 acres		Total
	Number	Percent	Number	Percent	Number	Percent	Number
Eastern	1,565	16	5,368	57	2,558	27	9,491
Southern	962	4	12,575	46	13,688	50	27,225
North Central	871	21	2,120	50	1,227	29	4,218
Rocky Mountain	637	49	389	30	227	21	1,303
Pacific Coast	2,684	45	2,220	37	1,035	18	5,939
Total	6,719	14	22,672	47	18,785	39	48,176

Source: U. S. Forest Service (77).

Natural factors influencing the spread of forest fires include the amount and character of the fuel, the moisture content of the fuel, the wind, and the topography (41, p. 148). The character and density of the stand, together with topography, have been suggested as constituents of a rate schedule and as items to be included in loss statistics. Relative humidity has been extensively studied in recent years as an index of fire danger (39) and can be recognized by the underwriter through the use of the humidity warranty (62, p. 132), which will be discussed more fully later. The wind factor, in the absence of improved wind records, Shepard believes, must be left out of statistical consideration for rating purposes (62, p. 79).

Effects Of Forest Fires

The major effects of forest fires requiring insurance consideration are injury to merchantable timber and injury to young growth. Such indirect forms of loss as injury to the soil, the replacement of good species by inferior species, reduction in the rate of growth of individual trees, increased susceptibility to attack by insects and disease, impairment of recreational and scenic forest values, increased soil erosion and water runoff, and the like are clearly not insurable under present conditions.

Fire damage to merchantable standing timber may, in unusual cases, entirely consume the tree; but generally only a portion is actually destroyed and in some cases a tree will be killed by heat without fire penetrating the bark at all. Hawley points out (41, p. 137) that death is caused by the killing of the cambium (the layer between the bark and the wood) and that a temperature of approximately 129° Farenheit is sufficient for this purpose. If the cambium is killed all the way around the tree, the tree is girdled and death results. Different tree species vary in their abilities to withstand fire, primarily because of the character and thickness of their barks; broadleaf species are generally more resistant than conifers and older trees of a given species more resistant than younger ones.

The fact that partial loss is so common and that trees may be killed with little or no immediate physical damage to the wood makes the problem of salvage of the utmost importance in forest insurance. The decision as to how long dead trees may safely be left standing before deterioration from insects and disease sets in, and as to whether trees injured but not killed should be cut, will depend upon the resistance of the particular species and upon climatic conditions (41, p. 138). Holbrook (47) tells of salvage operations in connection with the Tillamook fire of 1933 (in which 12½ billion board feet of timber were killed) and states that some 4 billion feet had been salvaged by mid 1943 and that work was still going on. It is interesting to note that salvage was later estimated to be in excess of 5 billion feet (57) and that the wartime shipyards of Portland were built largely with Douglas-fir from the Tillamook burn. Where prompt salvage is possible, fire-killed timber can frequently be disposed of with relatively little loss of its value before the fire.

This was true following the 1947 forest fires in southwestern Maine. In a recent study by the Northeastern Forest Experiment Station (56) it was estimated that by the end of 1948 some 125 million board feet (roughly 75 percent of the saw timber in saw-timber stands) had been cut or was under contract for cutting--most of the remaining fire-killed saw timber was in tracts not suited to economical operation. Maintenance of favorable stumpage prices during the period of cutting has resulted in advantageous salvage operations.

Damage to plantations and young growth is likely to be much more severe than in the case of mature timber--the bark of younger trees is thinner and crowns are nearer the ground (41). Such trees will not be merchantable for many years to come, during which time their weakened condition may expose them to insect and disease attack or to windthrow. Fires in hardwood stands often affect the future of the forest more than its present condition (76, pp. 857-861), a factor that may make it difficult for owners to see the need for insurance. Fires in softwood stands, on the other hand, are likely to cause immediate death of trees because of the tendency for fires to crown, the inflammability of foliage, the thinner bark, and in some cases the presence of pitch that causes fire to run up the tree.

Since the amount of damage may not be apparent immediately following a fire, either in extent of kill or extent of injury to trees not killed, Shepard recommends (62, p. 121) that forest insurance forms provide for delayed loss adjustments--December 1 of the year following the one in which the fire occurs is suggested as a suitable time limit.

Protection From Forest Fires

In the question of forest fire protection there are three main aspects to be considered: prevention, pre-suppression, and suppression. Probably few persons not connected with forest enterprise have any realization of the progress that has been made in this field during recent years (39). Some idea of the over-all effectiveness of forest protection is gained by comparing the percentage of protected area burned with the corresponding percentage for unprotected areas. The former figure is shown by table 4 to have been 0.81 percent for the Nation as a whole in 1945. While the ratio for unprotected areas burned stood at about 12 percent for the same year! Those wishing to familiarize them-

selves with this field will do well to consult Hawley's book on Forest Protection, referred to earlier (41). The writer is indebted to Hawley for much of the information presented on this subject.[6]

Prevention measures are aimed at eliminating or reducing the 90 percent of fires caused by man. They consist in part of educational efforts, and in part of enforcement of safety requirements. Educational work is carried on constantly by Federal, State, and private agencies in an effort to change public attitudes toward fire loss. The "Keep America Green" campaigns being waged in a number of States are examples of what is being done (13). Enforcement activities take the form of prosecution for violations of fire laws, formulation of safety codes, closing of hazardous areas during fire season, and similar actions. Specific measures are aimed at control of particular hazards such as requirements for spark arresters for locomotives in forest areas, permits for slash burning during fire seasons, or for complete shut-down of logging operations when relative humidity falls below a certain point.

A committee of the National Fire Protection Association has worked on forest fire prevention for a number of years with emphasis upon education, safety legislation, and study of improvements in fire-fighting equipment (6). Reference to the work of this committee is contained in the Handbook of Fire Protection (31).

The branch of protection known as pre-suppression is concerned with preparation for fires before they occur. Detection is accomplished through lookout stations and in some cases ground or air patrol. Communication is carried on by telephone and to an increasing extent by radio. This permits direct air-ground contact and is useful in keeping men on widely separated fronts of a large fire in touch with one another. Rapid transportation of personnel and equipment is essential to prompt fire control. Much progress has been made in building roads and trails, and as a consequence mechanized transport is being increasingly used. Parachute jumpers are being used by the Forest Service and are credited with control of many difficult fires in inaccessible places. Construction of firebreaks (not to be confused with "fire lines", the term given to lines constructed after a fire has started) is still another factor

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[6] An instructive picture of modern forest fire fighting on the West Coast will be found in the recent novel, Fire, by Stewart (69).

in pre-suppression. Also coming under this heading are efforts to reduce the quantity of fuel (through disposal of slash and underbrush, snag falling, etc.). Pre-suppression also includes disposition of tools, equipment and supplies, training of personnel, and arrangements for predicting fire weather.

Suppression itself has to do with the actual fire-fighting methods employed to combat different types of forest fires. A distinction is made between extinguishing fires and controlling them. The former refers to use of water, chemicals, or dirt to put out the fire or to beat the burning material back to separate it from new fuel. Water may be supplied by tank trucks, railroad tank cars, or from wells or surface sources close to the scene of the fire. Hand-pumps attached to cans strapped to the back are frequently used. Some use has been made of chemicals, including dusting by air. Dirt may be used to smother fires, either in mop-up work after the fire has been brought under control, or to extinguish the advancing edge of a surface fire.

In "controlling" fires, as opposed to extinguishing them, direct or indirect means may be employed. Direct control is accomplished by a narrow fire line dug down to mineral soil ahead of the fire. This line is then patrolled and the fire burns out to the line but is not allowed to jump across. This method might perhaps be regarded as analogous to the controlling of large city fires by dynamiting buildings in the path of the flames to create an incombustible area. In more difficult fires the indirect method is employed. This consists of backfiring from a firebreak or natural barrier that can be held, the backfire then advancing to meet the main fire. The indirect method may be the only means of controlling crown fires, whereas surface fires are fought by varying means as dictated by local conditions, available manpower, and equipment.

Both public and private protection are found in forest enterprise as they are in commercial enterprise. Public protection may be supplied by the State or local district (with Federal aid) or may be based on cooperative fire protection organizations to which timber owners make a direct contribution. Private protection may be limited in extent or, in the case of larger timberland owners, may be well organized and carry with it considerable expense. In commercial enterprise the relation between protection cost (where incurred directly by the property owner) and insurance cost has received careful study. Rating schedules are designed to encourage the reduction of fire hazard through credits for improved protection.

In forest enterprise this relation between cost of protection and cost of insurance must also be worked out--especially since protection expense may constitute a relatively large part of the cost of doing business. Forest-insurance rating schedules must give adequate recognition to approved protection measures on the part of the insured, and combined protection-insurance cost must not exceed what the business can carry. Shepard in 1937 worked out a cost relationship of this kind, based upon an assumed value of $25 per acre in the Northwest and a protection cost of 5 cents an acre or the equivalent of 20 cents per hundred (61). He believed that if the timber owner paid directly one-half of the protection cost, or 10 cents per hundred, and added to this an average insurance rate (for merchantable timber) of 45 cents per hundred, thought to be adequate for that area at that time, the resulting total of 55 cents per hundred would not be in excess of what many businesses should be able to pay.

Forest Ownership And Management Pattern

Simply because a forest is exposed to loss does not of itself mean that insurance is practical. For insurance to be successful a third factor must be present, namely, there must be such economic use of the forest that creates a need for the elimination of risk. Are our forests today being operated as a business? In order to answer this question one must examine the ownership and management pattern of the commercial woodlands and the economic trends working to change that pattern. Such a picture of how commercial timberlands are owned and managed should help to determine not only how much of a need for forest insurance there is, but also where a market can most advantageously be developed. The recent forest reappraisal studies of the Forest Service (80) have gone into this subject extensively, said to be the first time that comprehensive data on the management status of commercial forest lands have been collected.

The reappraisal studies show that out of 461,044,000 acres of commercial forest area in this country, 344,973,000 acres or 75 percent of the whole are in private ownership. In table 8 this figure is broken down into ownership by size of holding.

Three-fourths of the commercial acreage in private ownership is in holdings of less than 5,000 acres; more than 4,200,000 owners make up this group, and the average holding is about 62 acres. The "medium" and "large" groups, on the other hand, aggregate only some 3,500 owners with average holdings of approximately 10,000 acres and 127,000 acres respectively.

Table 8.--Distribution of privately owned commercial forest land by size of holding, 1945

Size of holding	Owners	Acreage held		Average size of holding
	Number	Thousand acres	Percent	Acres
Small (less than 5,000 acres)	4,222,137	261,385	76	62
Medium (5,000 to 50,000 acres)	3,171	32,916	9	10,380
Large (50,000 acres or more)	398	50,672	15	127,317
Total	4,225,706	344,973	100	--

Source: U. S. Forest Service (80).

The type of ownership is shown in table 9. Forty percent of the private commercial acreage is in farm ownership; 11 percent is owned by lumber companies and 4 percent by pulp companies (largely paper and paperboard manufacture). The remaining 45 percent, the bulk of which, like the farm woodlands, is in small holdings, belongs to investors, estates, professional persons, small businessmen and others. Many of these holdings represent absentee ownership (78, p. 34).

In all, the 75 percent of acreage held in tracts of less than 5,000 acres is owned roughly half by farmers, and half by other--often absentee--owners. The 25 percent making up the holdings of more than 5,000 acres is owned to the extent of perhaps two-thirds by the lumber and pulp companies, the balance representing miscellaneous ownership.

Table 9.--Distribution of privately owned commercial forest land by type of owner, 1945

Type of owner	Estimated number of owners	Acreage held	
	Number	Thousand acres	Percent
Farm	3,200,000	139,058	40
Lumber company	(1/)	36,573	11
Pulp company	(1/)	14,832	4
Other	(1/)	154,510	45
Total	3,200,000	344,973	100

1/ No data available.
Source: U. S. Forest Service (80).

Whether large or small holdings, farm or industrial ownerships, constitute the best prospects for commercial forest insurance depends to a considerable degree upon the kind of forest management or lack of it that characterizes them. What then is meant by "forest management"? This term connotes cutting practices and related forestry operations that keep the forest land productive. In contrast there are cutting practices that result in liquidation of the forest resource without regard for its future productivity. While there are naturally many kinds of forest operations, there is a well-marked distinction between "cut-out-and-get-out" methods on the one hand, and "sustained-yield" methods on the other. Since the difference is important and bears significantly upon the need for forest insurance, the distinction should be made clear.

So long as an abundant supply of timber is available, harvesting can proceed with little thought of future growth. Timber is regarded as something to be "mined" as coal or iron ore is mined. When the timber supply is exhausted in one locality the practice has been to move on to new areas and start again. This is "cut-out-and-get-out" lumbering, and the story of the progressive liquidation of the eastern and

southern old-growth stands is a familiar story. The 44,618,000 acres of remaining virgin timber referred to earlier is almost entirely in the Western States. While a substantial volume of timber is still available in the West, and while a few untapped areas remain--Alaska for example (78, p. 39)--nevertheless the existing reserves of old-growth timber are being reduced steadily and second-growth must be increasingly relied upon to supply the Nation's needs for forest products.

In recent years, as a result, the conception of the forest as a renewable resource, of "cropping" as opposed to "mining" the timber, has gained increasingly in favor. Just as forest liquidation without planning for the future may be likened to living on one's capital, to consumption of one's principal, so good forest management may be likened to living on the income that the timber capital is capable of producing. The building up of this capital, that is to say, of the timber growing stock, is of course a primary consideration along with satisfaction of current demand. This "sustained-yield" forest management implies "continuous production with the aim of achieving at the earliest practicable time, an approximate balance between net growth and harvest, either by annual or somewhat longer periods" (67, p. 83).

Sustained-yield management often employs some form of selective cutting, that is, "removal of mature timber...at relatively short intervals, commonly 5 to 20 years, repeated indefinitely, by means of which the continuous establishment of natural reproduction in the stand is encouraged and an uneven aged arrangement of ages is maintained" (67, p. 22). Another form of sustained-yield management consists of patch, strip, or seed-tree cuttings by which natural regeneration occurs in even-aged stands. Forest liquidation, on the other hand employs "clear-cutting"--the removal of all or virtually all timber over broad areas at one cut and the leaving of the land in a condition without any conscious provision for new growth. Sustained-yield methods, it will be observed, are poles apart from the ways of "cut-out-and-quit". What has all this to do with forest insurance?

The "Business" Need And The "Social" Need

It is submitted that the relation between forest insurance and forest management is twofold. On the one hand, a high degree of forest management should indicate a market for insurance. This is true for several reasons. First, the owner is conducting his operations as a long-range commercial undertaking. His capital is continuously tied up in standing timber since, generally speaking, he removes at each cutting

only such trees as have matured since the last cutting. Second, credit may be needed to finance current operations, capital improvements such as roads and equipment, the orderly marketing of forest products, debt retirement, land acquisition, and carrying charges incident to tracts not yet ready for harvest. Only with adequate insurance protection can the most advantageous credit terms be obtained. Third, good management indicates good fire protection. Fourth, good management, which implies good silviculture, means reduction of fire hazard. The need for insurance that grows out of intensive forest management may be called the business need for forest insurance.

At the same time forest management and insurance have a second relationship. Just as sustained-yield forestry acts as a stimulus to forest insurance, so conversely will insurance act as a stimulus to better forest management. Obstacles to changing over from a policy of liquidation to one of sustained yield are many and varied (24, p. 292), but at least one adverse factor will be removed if insurance is available. Wilson Compton, formerly secretary of the National Lumber Manufacturers Association, as long ago as 1923 stated, "certain it is that if a system of insurance can be developed at rates low enough to be borne by the revenues of the forest, it will contribute powerfully to putting our forest industries on a secure and permanent basis..." (30). There is today a growing realization that long-term low-interest forest credit and with it forest insurance is needed to assist private timber owners in adopting more productive management methods.

It should be borne in mind, furthermore, that sustained-yield forestry does more than merely assure adequate future supplies of saw timber, pulpwood, and other forest products. It also has a direct bearing on the stability of the wood-using industries and of the larger economic units of which they are a part. In an even broader sense sustained-yield forestry, by maintaining a forest cover on the land, helps in the conservation of soil, water, wildlife, and recreation values. Forest credit and its companion, forest insurance, are thus needed in the public interest as an encouragement to better forest management. This may be called the social need for timber insurance.

To what extent are the higher grades of forest management actually being practised today--in other words to what extent is there already a business need for forest insurance, and to what extent does the need remain a social one? Table 10 shows the situation in 1945.

Table 10.--Status of management on privately owned commercial forest land, 1945

Status	Acreage	
	Million acres	Percent
Under intensive management	2	0.6
Under good extensive management	15	4.4
Under fair extensive management	62	18.0
Without management	223	64.6
Nonoperating	43	12.4
Total	345	100.0

Source: U. S. Forest Service (80).

The terms used in this table reflect a combination of two factors--first, timber-cutting practices; and second, the character of fire protection. Thus "intensive" management indicates the best type of harvest cutting designed to build up and maintain the full productivity of the forest land, together with excellent protection. "Good extensive" management refers to a combination of good cutting practices with at least fair fire protection. "Fair extensive" management combines fair cutting practices with at least fair protection. "Without management" means that either cutting practices or fire protection--or both--rate poor or worse; and "nonoperating" areas are those not being worked for timber products. A high degree of correlation would seem to exist between the grade of forest management on the one hand, and a risk that a timber owner would wish to insure and that an underwriter would be willing to accept on the other. Generally speaking, unless an owner is managing his forest lands with a view to future productivity, he will not be in the market for timber insurance. At the same time, unless reasonably good protection is in effect, the underwriter will not be able to accept the business except at a prohibitive rate.

According to table 10, 2 million acres (about 0.6 percent of the total area) are under "intensive" management and 15 million acres (about 4.4 percent) are rated as under "good extensive" management. While the precise point on the scale at which forest insurance becomes feasible is of course not subject to accurate determination, it will

certainly be conservative to estimate that the 5 percent of the privately owned commercial timberlands under "good extensive" management or better (some 17 million acres) represents a "business" need and is today ready for commercial insurance consideration.[7] The balance would seem to fall beyond the scope of unaided private insurance enterprise at this time. If the "social" need, represented by some 95 percent of total acreage, is to be insured under present conditions, it can be insured only on the basis of public or joint public and private underwriting.

The author has suggested that at present the private companies are justified in looking to possibly 5 percent of the total market as a field in which to do business. This field, while substantial both in acreage and insurable values, is still relatively limited as compared with the whole. Is it likely to become larger as time goes on? The answer to this question may have an important bearing upon the willingness of insurance companies to enter upon a new and (to them) untried course. The Forest Service, and its reappraisal project, after analysing potential requirements for timber products, has concluded that under conditions of full employment the annual short-term needs of this country will aggregate approximately 15 billion cubic feet of timber (79). Over a longer period, the annual potential timber need by the end of the present century is estimated to be greater by some 1 billion cubic feet, or 16 billion cubic feet in all. Adding to this estimate an allowance for losses by fire, insects, disease and other natural causes, together with a margin of safety to take care of new uses, export, and possible national emergency, leads the Forest Service to set a goal for annual timber growth of 20 billion cubic feet, of which 72 billion board feet should be in saw timber (78, p. 6).

As of 1944 growth was estimated at less than 14 billion cubic feet in all, of which saw timber represented but 35 billion board feet. Moreover, present drain on the timber resources is already exceeding current growth by substantial amounts. Original old-growth stands are diminishing; import prospects are not encouraging (78, p. 40).

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[7] It is interesting to note in this connection that the forest land area in certified "tree farms" (12) has now reached a total of 15.7 million acres.

The answer is clear--if we are to have timber we must grow it ourselves. "For three centuries we, as a nation, lived in an era of timber abundance. Now we have passed into an era in which we must depend increasingly upon the timber we grow each year" (78, p. 1). To grow more timber we must have better cutting practices and better forest protection, i.e., more intensive management of our commercial woodlands. More intensive management leads to a need for insurance. The author concludes, then, that the field for the private companies is an expanding one and that underlying economic factors are working in their favor.

THE EFFECTIVE DEMAND

So much, then, for the basic need. Can this need be translated into an effective demand? The main concern here is with the "business" need--the 5 percent of the market already believed to be a potential commercial risk. The "social" need can perhaps be met through a long-term low-interest forest credit program under Government direction, in which insurance might play a subsidiary role. That some thinking along this line has already taken place will be seen from the discussion of "Considerations of supply". For forest insurance to be written commercially, however, woodland owners must be ready and willing to buy insurance and the price must be such that it can be absorbed in the cost of growing timber as a business. The unique importance of widespread demand if forest insurance is to be successfully written need hardly be emphasized. Unless underwriters can get a spread of risk, the law of large numbers does not operate and they are unable to obtain underwriting results based on the true average of the class.

Factors Underlying Past Lack Of Demand

That there has been in the past and is now relatively little articulate demand for forest insurance on the part of timber owners is readily confirmed by brokers in touch with the situation. Moreover, such companies that do accept timber risks report comparatively little interest. In this connection it is pertinent to inquire (1) why there has been so little demand, (2) whether a demand can be created, and (3) what action the situation warrants.

Three factors appear to have been responsible for the lack of demand: high rates, absence of sales promotion, and the undeveloped state of forest enterprise. High rates are perhaps most frequently

blamed, and not without reason: charges ranging from 1 percent to 5 percent and even higher cannot reasonably be expected to attract business. There is some difference of opinion as to why rates are high. The obvious answer that they are high because of the inherent hazard does not suffice in all cases, since the burning ratio in many areas compares favorably with that of property now the subject of insurance. Some underwriters may charge high rates because of lack of knowledge of what the hazard really is. This is hardly the whole story, however; it seems likely that narrow spread of risk is the more fundamental cause, and statements made to the author by individual underwriters bear this out. If the above reasoning is correct, it would appear that rates could be lowered by a better understanding of actual present-day hazard and protection conditions on the one hand, and by obtaining a wider spread of risk on the other.

Absence of sales promotion on the part of the insurance business is often blamed as the cause of the trouble. It is of course true that there has been relatively little effort to arouse interest in forest insurance by the insurance companies and only sporadic attempts on the part of others. Sales promotion in the absence of carefully planned market analysis is of doubtful value, and in the absence of such analysis it has perhaps been fortunate that matters have not got off to a false start. While high rates and lack of promotion will explain the lack of demand from the segment of the market practising more intensive forest management (the 5 percent), it is the third factor--the undeveloped state of forest enterprise--that accounts for the absence of demand from the balance of the market (the 95 percent).

Measuring Present Demand

In seeking to find the reasons for lack of forest insurance demand, the second question--can a demand be created?--has answered itself. While it would be premature to look for any sizable demand from the greater part of the commercial timber ownership, it is not too much to expect from that portion practising intensive management. A demand can be created if efforts are directed toward those in need of the product. Rates must be made to reflect actual hazard and a spread of risk must be obtained. Sales promotion must be based upon market analysis.

Twenty years ago the United States Chamber of Commerce stated in its Forest Insurance Report that "the demand for forest insurance has not been sufficient to date to warrant the expenses which would be

involved in actively soliciting the business", and added that this was due to the fact that "it is only at the present time (1927) that we are beginning to enter the period of economic development wherein it is cheaper to grow timber for production than it is to cut that which is standing" (66, p. 77). That progress has been made since that time is shown by the following recommendation from the Program of American Forestry adopted by the membership of the American Forestry Association in 1947 (15):

> "We propose:
>
> "20. long-term forest credit and insurance facilities to encourage intensive management of woodlands and continuous production of timber.
>
> "These aids to the financing and security of long-term investments in timber growing have long been under study. Specific plans are now under consideration by the Farm Credit Administration and by private agencies. The present higher values of forest products and forest growing lands and the generally reduced losses from forest fires make these services more feasible than ever before. They are needed as practical business aids to full production."

The Program of American Forestry from which this quotation is taken was an outgrowth of the American Forest Congress to which reference was made in the introduction. The Forest Congress held in 1946 was the third in the seventy-odd years of the American Forestry Association and carries weight as an expression of conservation and management thinking. That labor is also interested in forest insurance is indicated by the C. I. O. endorsement of the Hook Bill, while the position of Government is shown by the quotation at the beginning of this article. When Government, labor, and management are all of the opinion that action is needed, it would seem that the time had come to do something about it.

In order to make a beginning, it is suggested that a market analysis be undertaken of the demand for forest insurance. This could take the form of a careful sampling of opinion among timber owners practising the more intensive grades of management of their woodlands. The Forest Service reappraisal project has developed valuable information with respect to the management status of commercial forests and these data should be of great assistance to such an insurance analysis. Previous attempts to ascertain demand were of a regional or local nature and are in any case long outdated. In 1926, for example, the Western Forestry and Conservation Association sent several hundred questionnaires to concerns in

the States of Washington, Oregon, California, Montana, and Idaho (66). While most replies were contradictory or indefinite, about sixty were useful. Of these, one-half indicated that timber owners were interested in forest insurance. Those interested represented some 800,000 acres valued at about $54 million, well spread in all five States. The association attributed the small number of replies to lack of a specific insurance proposal and estimated that timberlands worth $100 million would be offered for insurance if satisfactory terms were available.

Aside from the work of the Western Forestry and Conservation Association, samplings of demand have been almost entirely lacking, although Herbert (43) does mention that the members of the Empire State Forest Products Association (New York) were circularized on the subject in 1922, and that lumber owners in Michigan were questioned in 1924 by the Forestry Department of Michigan State College.

The agency to conduct a survey of the sort suggested, and the data that it should seek to develop, will have to be determined through joint consideration of the subject on the part of interested groups. It would seem, on the first count, however, that the resources of the Federal Government in the field of forest economics should not be overlooked and that much would be gained by close cooperation between private business and public agencies.

As to the nature of the data to be developed, there is a difficult situation. Timber owners find it hard to say whether or not they would buy insurance until they know the rate of premium that must be paid. On the other hand, it is not easy to fix a rate until the extent of participation is known. To cut this Gordian knot it has been suggested that timber owners be asked simply what insurance would be "worth" to them, that is, the maximum price at which insurance protection would prove attractive and could be absorbed in the cost of doing business. Standard forms for merchantable timber and second-growth, such as those developed by Shepard for the Northwest and Northeast, could be used as a basis for purposes of the survey.

The economic development of forest enterprise makes such a market analysis necessary at this time. The recent reappraisal of the Nation's forest situation and the continuing forest survey activity of the Forest Service make it feasible as well.

CONSIDERATIONS OF SUPPLY

EFFORTS TO SOLVE THE PROBLEM ABROAD

As indicated in the introduction, forest insurance has been written in Europe for more than 75 years. Perhaps the most surprising feature of this development, from the standpoint of the United States, is that so little is known about it. The writer has been able to locate only a relatively small number of references to the insurance of standing timber abroad, and such references that were found came for the most part from forestry and timber trade sources, as contrasted with insurance sources. In insurance circles, the only systematic attempt to keep abreast of foreign developments in this field appears to have been the short-lived Journal of Insurance and Financial Statistics (later the Journal of Insurance Research), which was published for a few years in the early 1920's. The case for insurance research has been convincingly stated (23) and here one need only point to forest insurance as an example of a field in which lack of knowledge of the experience of others has proved a handicap.

International And Regional

Before going into forest-insurance developments in a number of individual countries, it will be of interest to mention two or three instances in which forest insurance has been the subject of attention at the international level.

The International Institute of Agriculture was established in 1905 with headquarters in Rome to study problems of agricultural production, marketing, insurance, and credit. It was a pioneer in the field of international economic cooperation, being one of the first of the permanent official international organs that have since become so numerous (14). A bibliography on crop and livestock insurance prepared by the Bureau of Agricultural Economics (72) shows that the publications of the institute contain a number of early references to forest insurance. In 1923, at the Eleventh Congress of Agriculture, held in Paris, a resolution was adopted urging that participating nations give attention to the fields of forest-fire protection and insurance, while the year before the institute had acted to set up an international statistical service to collect information on the forest-fire experience of various countries (34).

The newly established Food and Agriculture Organization (FAO) operating within the framework of the United Nations has been studying the broad problem of preventing the forests of the world from becoming wasting assets and of assuring a continuous supply of wood at prices within the purchasing power of the average man (36). As one approach to these goals the FAO Interim Commission suggests more intensive forest protection and management, stating that today two-thirds of the world's forests receive no protection or care. While forest insurance is not mentioned specifically, one can be sure that as a tool for obtaining better forest management and protection, it falls within the FAO's sphere of interest. The Interim Commission has recognized the need for world correlation of forest research, and it may well be that some day the FAO will carry forward the concern of the International Institute of Agriculture for the insurance protection of the world's forest resources.

International interest in forest insurance upon a regional basis is found in the Scandinavian Forest Fire Insurance Union organized at the first Northern Forest Fire Congress held in Oslo in August 1930 (18). This effort stemmed from the insurance business; and companies in Norway, Sweden, Denmark, and Finland were represented. The Union was established to collect statistics and information on forest-fire protection and insurance for the benefit of member companies, and actual promulgation of rates may also have been in mind. A second Congress was to be held in Finland in 1932 and the Eastern Underwriter tells of a third meeting in 1934 (5).

National Efforts

In taking up the experience of individual countries it will be logical to start with Scandinavia, where forest insurance has reached its highest development, and follow this with a discussion of other European countries and conclude with some mention of Japan. The experience of Sweden perhaps holds the greatest interest and it will be worthwhile to examine it in some detail; an excellent account is available in the Swedish Insurance Yearbook for 1937 and much of the discussion that follows is taken from this source (71).

As early as 1878 an attempt was made, at the suggestion of the Director of the Royal Forest Institute, to organize a forest-fire insurance company; and a charter and bylaws were drawn up. Response was slight, however, and the project was not carried forward. Thirty-three years later, in 1911, another attempt was made, this time along mutual lines. The minimum portfolio was set at 50 million kronor (approximately 12½ million dollars) with a minimum of 500 members. Coverage was apparently to be offered both on young growth and merchantable timber with rates in the range of 1 0/00 to 2 0/00, that is, 0.1 to 0.2 percent. (European fire-insurance rates are frequently expressed per thousand,

symbol 0/00, instead of in percentage. A rate of 1 0/00 is thus equivalent to 1 per thousand or to 0.1 percent--what in this country would be known as a rate of 10 cents. In order to avoid confusion rates will be expressed on a per thousand basis followed by the equivalent in cents.) The time was not yet ripe, however, and this effort likewise failed. A severe fire season again focused attention on the problem in 1914 and unsuccessful efforts were made to form a timber-owners' mutual in that year and again in 1922.

In the meantime the Swedish Fire Tariff Association, representing stock-company interests, had been studying the problem with particular reference to the insurance of young growth--always a more difficult problem than the insurance of merchantable timber since expectation value as opposed to present market value is involved. Moreover, fire may entirely destroy young growth, whereas mature timber will frequently have appreciable salvage value. In 1919 the Tariff Association committee that had been studying the matter brought forward suggestions for broader coverage and reduced rates and as a result forest insurance began to make progress. Whereas some insurance had previously been written on merchantable timber at 5 0/00 (50 cents), the rate for merchantable timber was now brought down to 0.5 0/00 (5 cents) and for young growth to 2 0/00 to 3 0/00 (20 to 30 cents), with an average rate of 1.20 0/00 (12 cents) over the class as a whole. Because of the increased spread of risk and the development of the business generally this figure was stated in 1937 to be down to 0.68 0/00 (6.8 cents.)

Insurance companies were slow to take up the new form of coverage even after the favorable report of the Tariff Association, lacking as they did both experience and knowledge of the field. The Swedish Veritas set up a forest-insurance underwriting department in 1920 and was later joined by the Skandia and several other companies, both tariff and nontariff, stock and mutual. Progress in more recent years has been substantial, as indicated by the following tabulation of insurance in force.

Year	Million kronor
Before 1920	1/ 10
1921	90
1925	300
1930	800
1935	1,200
1937	1,400

1/ Estimated.

In 1937 it was estimated that some 7½ million hectares (equivalent to more than 18½ million acres) or 43 percent of privately owned woodlands were insured, with perhaps 110,000 forest owners having forest-insurance protection. Forest owners taking out insurance ranged all the way from home owners with small holdings to the largest owners, including many of the pulp and paper companies. For the larger owners catastrophe covers are available, thus permitting self-insurance for losses of moderate size. Rates for such coverage may go as low as 0.25 0/00 (2.5 cents).

Following the experience of Norway and Finland, a form of perpetual or single-premium forest insurance was made available in Sweden in 1936. Perpetual insurance assumes that forests will maintain a fairly constant age-class distribution under sustained-yield operation as required by Swedish law (19). To qualify for perpetual insurance a forest may have not over 50 percent in plantations and young growth. The perpetual premium deposit, assuming an annual rate of 0.75 0/00 (7.5 cents) is calculated on the basis of a 25 percent discount or rate of 0.5625 0/00 (5.625 cents) which is then capitalized at 3 percent producing a single deposit of 19.31 0/00 ($1.93 per hundred). The perpetual form of coverage is advantageous in respect to company expense and it represents a corresponding saving to the insured. As an additional inducement, perpetual policies cover fire loss to the forest soil without additional cost. The perpetual deposit may be paid in installments over as long a period as 25 years with proportionate rate adjustments.

Underwriting experience is said to have been favorable, with no company having had a loss ratio in excess of 45 percent in any year, and in general the loss ratio has been much under this figure. While the writer has unfortunately not had data available for the period since 1937 one may safely assume that forest insurance remains a well-established feature of Swedish economic life.

In Norway, forest insurance had been under discussion for some 40 years before timber owners organized the Norwegian Mutual Forest Fire Insurance Company in 1912 (48). This organization, said to be the first in the world devoted exclusively to forest insurance, was still, at last accounts, the only company writing this type of insurance in Norway. The company insures young growth but (at least in its earlier years) did not insure merchantable timber--the reason being that the open character of the forests minimizes fire damage to larger trees that in any event possess salvage value. The forest soil is insured, and this is an important form of protection in a country where the thin layer of soil lying on the rock or sand base may be severely damaged by fire. Both annual and perpetual policies are available; in 1936 the latter type was said to comprise about 75 percent of the total insurance in force (19). Approx-

imately 2.2 million hectares (equivalent to more than 5.4 million acres) or some 45 percent of privately owned woodlands were insured 10 years ago--a percentage that closely parallels that of Sweden. At that time there were some 15,000 forest owners in Norway having forest-insurance protection with insurance in force to the amount of 366 million kronor. Recent information about rates is not at hand, but the rate structure is believed to be roughly comparable to that of Sweden. A perpetual deposit of 1.1 percent ($1.10 per hundred), covering both land and growing stock, is mentioned by Kissin (52, p. 14). Forest insurance has greatly facilitated the securing of credit on timber properties, most lending institutions requiring insurance as a prerequisite for loans. One agency was said to make a practice of lending up to 60 percent of the value of insured properties, whereas only 30 percent could be borrowed on uninsured properties. Insurance interests have been active in fire-protection work and are credited with real accomplishment in this field (29).

In Finland, forest insurance received serious consideration as early as 1911, and in 1914 the Sampo Mutual Insurance Company commenced writing this type of insurance (72, item 354). In 1916 the Forest Owners Mutual Forest Fire Insurance Company was formed and the two companies later maintained uniform rates and policy conditions. Full insurance to value was written with use of the three-fourths loss clause. In 1937 a number of companies were writing the business (7) and there were some 46,000 insured risks. Some 4.2 million hectares (equivalent to more than 10.3 million acres) or 32 percent of the privately owned timber lands were insured, and insurance in force amounted to 450 million kronor (71). Fifty percent of the insurance in force was written upon the perpetual basis (19). Since 63 percent of the area of Finland is in timber and since lumbering occupies a preeminent position in the economy of the nation, the importance of forest insurance can be readily appreciated.

Elsewhere in Europe forest insurance has made some headway--without, however, reaching the position that characterizes it in the three countries just discussed. Herbert (44) states that in Denmark the Danish Plantation Society has been active since 1902--only plantations being covered. In 1937, insurance in force amounted to some 16 million kronor covering 40,000 hectares--slightly under 100,000 acres (71). In the Low Countries, a mutual company was established at Zutphen in the Netherlands in 1894 but was stated to be limited in its activities because of the relatively small part that forest enterprise plays in that country (34). In Belgium a commission appointed some years ago to study forest fire insurance concluded that mutual insurance was not feasible, because of the difficulty of obtaining a sufficient spread of risk, and that such protection should be obtained through the regular commercial carriers. Premium rates were high, and steps to reduce the fire hazard were recommended (4). In Switzerland, Herbert states (44), limited coverage has been available since 1906, but the author has no recent information. In

Livonia (former Russian province later divided between Latvia and Estonia and now once more a part of Russia), Heske (45, p. 310) mentions that forest insurance was being written by a mutual society in 1903.

In Spain various methods of providing forest insurance had been under consideration between 1914 and 1929 and a mutual company was organized in 1922. A royal decree of September 6, 1929, contemplated a national forest-insurance organization under the dual control of the departments of labor and development. A council of fourteen named by the government, consisting of eight government officials and six private citizens, was to direct the new organization. Insurance was to be compulsory for public forests (most of which belonged to villages) and voluntary for private forests. In launching this plan it was hoped that it would stimulate fire-prevention activities and at the same time facilitate forest credit needed for financing roads, buildings, and reforestation (58). Later a combined forest-insurance and credit organization was decreed in 1931 (royal decree of April 10), which was apparently to have taken the place of the original body. Kissin stated in 1945 that he had been advised that the scheme was shelved following the fall of the Spanish monarchy and that it had never been put into operation (52). The approach under consideration in Spain contained some novel features, and it would have been instructive to follow its development.

France seems to have been actually utilizing forest insurance prior to 1870, since severe fires in the pine forests of Gascony in that year caused such heavy losses that existing insurances were not renewed (72, item 361). A forest-owners mutual insurance company was organized at Paris in 1909. Woolsey wrote in 1920 that little forest insurance was being written in France at that time and that what was written carried high rates of premium (85). He quotes a rate schedule ranging from more than 7 percent for young-growth conifers to 4 0/00 (40 cents) for mature trees over 50 years old, but it is doubtful whether much business was actually placed at these rates. A mutual reinsurance organization was set up in 1928 principally to cover young stands. Rates from 0.5 0/00 to 2.5 0/00 (5 cents to 25 cents) were charged for hardwoods and from 0.5 0/00 to 1.2 0/00 on conifers (83). In 1931 a conference in Paris decided to set up a permanent organization to study forest insurance (3). More recently there was an interesting attempt to encourage the planting of stock suitable for paper pulp through the providing of fire-insurance protection on a new plantation without direct cost to the landowner. The association sponsoring the plan apparently bears the expense of the insurance during the 15-year period during which it is operative (38).

With respect to Germany there is a relatively recent (1938) account of the development of forest insurance (45). Chapter 25 of Heske's book on German Forestry treats in some detail the questions of forest fires and forest-fire insurance and is followed by a discussion of forest credit that also bears upon this subject. While forest insurance was first suggested in 1877 it appears that it did not become available in Germany until 1895 when the Gladbach Fire Insurance Company began to write this class (1). According to Heske this is the only private company that has taken an active interest in forest insurance; it regards it as accommodation business, believing it to be an unprofitable line when taken alone. In addition to this carrier, forest insurance has been written by state insurance offices, notably that of Bavaria (Bayerische Waldversicherung), which entered the field in 1920. The latter was organized on mutual lines and is (or was) under the supervision of the ministries of finance and interior. It insures only "juristic" entities, that is, municipalities and other instrumentalities of local government, public welfare organizations, institutions, and associations. Individuals can obtain coverage only through belonging to a member organization. All forest areas belonging to an insured must be insured. Premiums are based upon a flat area charge without regard to age or character of stocking, while losses are paid upon the basis of the value of the timber damaged or destroyed. Heske states that use of a flat area charge avoids expense and makes for simplicity when the insurance is placed, and that the danger in employing different bases for computation of premiums and payment of losses is offset by the fact that the liability under the policy is a limited one, a maximum of 400 marks per acre, equivalent to $163 per acre (1938). Additional coverage can be obtained for an increase in premium. Premiums were paid annually and ranged from 2 to 12 pfennigs per acre (0.8 cents to 4.8 cents per acre 1938).

Heske goes on to make some observations based upon German experience that will sound familiar to those knowing the situation in this country. He states that forest insurance is needed: first, to protect forest owners from economic loss (especially the smaller owners since larger owners can self-insure); second, to encourage private owners to undertake forest management and so discourage timber exploitation; third, to make standing timber eligible for forest credit. He points out that since standing timber represents more than 75 percent of the value of a sustained-yield forest, forms of credit that take into account only the value of the land are of limited usefulness. Obstacles to the writing of forest insurance in Germany are listed as follows:

1. High premiums due to meager participation and adverse selection.

2. Difficulty and cost of making valuations of forest property.

3. Difficulty in accumulation of the necessary reserves.

4. Uneven distribution of forest fires.

5. Lack of interest.

Heske believes that the state should promote forest insurance and encourage wide participation in it as an important aspect of forest policy.

Something remains to be said of forest insurance in Japan. M. Yatagai, Professor of Forestry at the Imperial University, writing in the Journal of Forestry in 1932, stated that the Toho Fire Insurance Company of Tokyo was the first company to write forest insurance in that country, setting up a separate underwriting department for the purpose in 1920 (86). The Teikoku Fire Insurance Company followed in 1923, the Tokyo Fire and Marine in 1926, and the Tokyo Fire in 1931. The amount of insurance in force made slow progress, and in 1932 only 450 contracts were in effect, covering an insured area of 25,600 hectares (63,258 acres) equal to less than 1 percent of privately owned woodlands. Given as an explanation for the slow development is the limited coverage available, only plantations up to 10 years old being acceptable risks. Most of those who took out insurance did so as security for credit: and as banks were not accustomed to lending on natural growth, only plantations were insured. Rates were based upon a territorial classification depending on climatic conditions, age classes, and type, (hardwood, conifers, and mixed); and these rates ranged all the way from 3 percent to 0.1 percent. The insured appears to have had the option of loss adjustment based either upon cost (expense of planting--average for the region--plus taxes, protection, and other overhead charges) or market value, the basis agreed upon being specified in the contract. The practice differed from that used in Europe, where it is customary to use cost or market value, whichever is the higher.

Concern over the slow rate of growth led to study of the situation by foresters and the government. Difficulty in accumulating reserves due to severity of fires in plantations, insufficient statistics for adequate rate-making, and high rates as a deterrent to demand were all recognized. Four remedies were considered: (1) government subsidy of private companies, (2) organization of a mutual company with government support, (3) government reinsurance of private companies, and (4) government insurance. The last choice was decided upon in 1929 but for financial reasons was not immediately placed in operation.

From a recent study of forest insurance in Japan, Melis[8] states that the government did actually undertake forest insurance in 1937 and that it has developed rapidly since that time. Plantations up to 20 years of age may be insured at rates close to 5 0/00 (50 cents). Between 1937 and 1944 contracts in force increased from 5,500 to more than 176,000 and the area covered increased tenfold. The government subsidized the operation at the outset, but starting with the fifth year it has been able to show a profit. Melis believes that the limitation of coverage to stands under 20 years old, small average size of policies, and differences in fire hazard conditions all tend to minimize the value of Japanese experience as a guide for the writing of forest insurance in the United States.

The foregoing references to forest insurance outside the United States are obviously fragmentary and unsatisfactory. Do they hold anything of significance for us? Or are conditions abroad with respect to both forest hazards and management on the one hand and insurance practice on the other so different from those existing here that foreign precedent will be of little help in the solution of our own forest insurance problems?

Four things at least are clear. First, standing timber (including young growth and plantations) can, given certain conditions, be an insurable risk. Second, a long period of trial and error may be required to find the solution best suited to the needs of a particular area. Third, forest insurance has, in some countries at any rate, been successfully underwritten by private companies over a considerable period of time. Fourth, in still other countries, forest insurance has become the province of the government--private companies having abandoned the field or limited their activities in this class of business.

It is interesting to note that it is in the Scandinavian countries that the private companies have been most successful, whereas it is in Germany and Japan that the government has tended to play more of a part. Whether this is solely because of underwriting considerations growing out of physical hazards and conditions or whether it stems from more basic differences in the economic patterns that have evolved in the respective

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[8] Melis, P. E. Government forest fire insurance in Japan. Hq. Supreme Command for Allied Powers, Nat. Resources Sect., Forestry Div. 17 pp. (processed.) 1946.

areas is a question that can hardly be answered here. If, as seems likely, however, the economic "set" of a country has an important bearing on the problem, will not the United States, while learning from the experience of others, need to work out a solution geared to its own particular social and industrial requirements? Perhaps the situation in this country can best be met not in terms of all private insurance or all government insurance, but in some combination of the two. This possibility should be borne in mind in considering the problem of insurance "supply" in the United States.

EFFORTS TO SOLVE THE PROBLEM AT HOME

In surveying the efforts that have been made to apply insurance to forest lands in the United States, one can differentiate between facilities actually offered and those that have been merely proposed. There are five to examine in each group. Forest-insurance plans that have reached the market will be considered first.

Facilities Actually Offered

1. Phoenix Assurance Company of London

This company is believed to have been the first to actively solicit forest insurance in the United States (44, p. 15), although Lloyds of London wrote an interesting excess cover on Canadian spruce in 1911, to which reference will be made later. Herbert states that the Pacific Coast department of the Phoenix announced in 1916 that it would write standing timber in Washington and Oregon west of the Cascade Mountains. Rates ranged from 1 percent to 1.5 percent for timberland owners and from 0.5 to 0.75 percent for bondholders, with a discount of 33.33 percent for approved protection (27). The maximum liability subject to one fire was set at $17,500. A number of lines were written on fir, spruce, cedar, and pine; but tracts were accepted only if accessible to market and not unduly exposed. The Phoenix ceased writing forest insurance in 1918, the class having proved unprofitable. Timber owners are said to have considered the coverage unsatisfactory because of the limited facility available and because of coinsurance requirements.

2. Timberlands Mutual Fire Insurance Company

This interesting pioneering venture was launched at Portsmouth, New Hampshire, in 1917 (25), interest in forest insurance having been stimulated by the passage of the Weeks Law some years before (24, p. 189). This law provided for Federal-State cooperative fire protection and was the forerunner of the Clarke-McNary Act of 1924, which so greatly expanded the program of Federal aid for this purpose. After observing for 6 years the workings of the Weeks Law in New England, a group of nine industrial and individual timberland owners formed the Timberlands Mutual on an experimental basis, data over widely separated areas having shown that an annual burning ratio of less than 0.5 percent might reasonably be expected.

Charter powers of the company permitted insurance against loss by fire, lightning, "or other destructive elements or causes"--a provision that perhaps indicates that all-risk insurance was contemplated although none was actually written (53). The mutual form was adopted as best suited both to the laws of the State and the purposes of the organization. Assuming a pure loss cost of not more than 0.5 percent, an expense loading of the same amount, and a contingency loading of 1 percent, a flat rate was set at 2 percent, covering merchantable timber, young growth, and plantations. This rate was later reduced to 1.75 percent and a further reduction to 1.5 percent was under consideration when the business was sold in 1919.

During the first season 62 policy-holders were covered for an aggregate amount of $276,000, distributed over 57 towns in New Hampshire, Massachusetts, and Vermont. Insurance in force was distributed as follows:

	Percent
Merchantable timber	87.4
Young growth	8.4
Plantations	4.2

Maximum liability on any one risk was set at $5,000 and the greatest loss during the 2 years of operation was $600 on the total loss of a young plantation.

Just why the company decided to terminate its activities in 1919 is not entirely clear; the statement has been made that having established the principle, the management was not interested in the commercial aspects of the business. The war was doubtless a factor in the decision, and a limited local market together with stringent deposit requirements for entering additional States may have been other considerations leading to termination. Outstanding risks were reinsured in the Globe & Rutgers, and the latter company continued the business, without active solicitation however, for some years.

Experience gained from the Timberlands venture was discussed by Brown (one of the originators of the Company) in the Journal of Forestry in 1926 (28). With respect to the type of carrier best suited to underwrite forest insurance, it was Brown's feeling that a new company, organized specifically for the purpose, labored under a serious handicap in regard to the adequacy of its reserves. Without sizable resources, a new company finds expansion difficult and entrance requirements for operating in additional States a heavy burden. A mutual, he thought, operating over a large area and thus obtaining an adequate spread of risk, could safely write forest insurance, but he refers to the old-line stock companies as being in a good position to undertake the business because of their large reserves and capital funds. In order to get started, forest-fire insurance must, he believed, have large reserves or Government backing.

Brown felt that only fire coverage should be offered at first and that all-risk insurance must wait until actuarial data are available. It was the experience of the Timberlands Company that merchantable timber was the most desirable risk because of better care on the part of the owner, greater resistance to fire, and salvage possibilities. The company reserved the right to pay a total loss and then dispose of salvage for its own account, salvage operations naturally being influenced by transportation facilities and accessibility of markets. Total losses were rare except in the case of plantations. The forest underwriter, it was felt, should be trained for his work through timber cruising and other woods experience and if possible should also have had some operating experience in the lumber business. The cost of inspection of risks was found to be prohibitive on the smaller lots and the conclusion was reached that underwriters should accept the owner's valuation relying upon the coinsurance clause to maintain insurance to value. Risks should of course be accepted only where protection was adequate, and protection expenditure per acre in accord with the needs of the region should be insisted upon if forest insurance were to be undertaken successfully.

Brown suggested by way of illustration an expenditure of 1 cent per acre in New England, 0.25 cent to 0.5 cent per acre in the Province of Quebec where large areas are uninhabited, 2 to 3 cents per acre in the Middle West, and 5 to 6 cents per acre in the Northwest where values are high and conditions more hazardous. As to rates, the Timberlands Company believed that the large owners were not interested at 1 percent, but that they might be interested at 0.5 percent. The largest owners could doubtless self-insure, but with sufficient participation might well get an advantageous rate from private companies.

Demand, it was thought, would come from owners of timber one-half to two-thirds grown since they could pay premiums for the balance of the period to maturity and then make up the cost out of sales; from those needing credit[9]; and from farmers and other small owners. Plantations would be too expensive to insure to represent an extensive market, but some need for such coverage might be expected from water company reservations, windbreaks, and similar properties.

3. Home Insurance Company

The Home Group commenced forest-insurance underwriting on merchantable timber in the Northeast in 1923 and extended this to include plantations the following year (44, p. 16). While coverage on plantations is no longer available, that on merchantable timber is still offered in a limited way and constitutes today one of the few facilities of this nature in the United States.

According to the company's printed rules for standing timber insurance, it does not desire to insure lines greater than $25,000 subject to one fire. Coniferous (softwood) or mixed-growth lots that are being operated will not be accepted unless cut off by suitable barriers such as streams, open fields, roadways, and the like. Under some conditions, however, tracts consisting of hardwood growth only will be considered even when being operated. Woodlands operated within the past 5 years (or tracts exposed by such lands, unless cut off by suitable barriers) will not be accepted unless slash resulting from the operation has been gathered and destroyed.

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[9]Some banks in New England had made insurance obligatory for borrowers when it became available.

The company's printed rate schedule for standing timber, dated 1932 and stated to be still in effect, starts with an annual base rate of $1.25 per $100 and is subject to various charges and credits. A somewhat detailed application is required, giving information as to ownership, characteristics of the timber to be insured, exposures and other hazards, and previous loss experience. The application calls in addition for a diagram of the tract or, in lieu of this, a map or survey. The signed application is made part of the policy.

A merchantable standing timber form is used (see Appendix, Exhibit A), in which merchantable timber is defined as living trees of 6 inches d.b.h. or greater and free from seen or unseen defects. The form contains the dry-season clause, provides for a stated limit per acre, and calls for 90 percent insurance to value.

It is understood that writings consist chiefly of the smaller woodlots in the Northeast. The class is regarded as accommodation business and is not actively solicited, although experience is believed to have been fair on such lines that have been accepted.

4. Hartford Fire Insurance Company

With the exception of the Home Group and occasional lines written by other companies, the Hartford is the only carrier known to the writer that today provides some market for forest insurance.

The policy form used by this company provides for coverage on young growth and plantations in addition to merchantable timber, and follows very closely that recommended by Shepard (64) for use in the Northeast (see Appendix, Exhibit B). A signed application is required and is made a part of the policy--here too the wording is practically identical with that recommended by Shepard.

The Hartford has been interested in forest-fire insurance for a number of years and keeps in close touch with developments in this field. An attempt is made to meet the needs of the individual assured, and risks are rated in most areas where business is written by using a schedule of charges and credits. This company likewise looks upon timber insurance as accommodation business and does not actively solicit it. Lack of demand rather than underwriting hazard, however, is regarded as the limiting factor in the development of this class of insurance.

5. War Damage Corporation

While coverage offered by the War Damage Corporation was restricted to damage resulting from "enemy attack including any action taken by the military, naval or air forces of the United States in resisting enemy attack" and so represented a limited and specialized form of insurance protection, nevertheless it is of interest as the first example of forest insurance on a Nationwide basis in this country. The standard policy of the War Damage Corporation specifically excluded standing timber (8); however, under Rule 26.01, issued in July 1942, shortly after the corporation commenced operation, it was provided that this might be added by endorsement without limitation as to amount (10). The applicant was required to state the description and location of the property to be covered, together with the amount of insurance desired. Use of the 100 percent coinsurance clause was mandatory and the rate charged was 15 cents per $100.

Unfortunately, standing timber was not classified by the War Damage Corporation as a separate type of insurance coverage, and consequently is not shown separately on any of the corporation's statistical reports[10]. For this reason, the writer has been advised, there appears to be no way of getting information as to the amount of standing timber insured in this manner during World War II.

Facilities Proposed

Besides forest insurance that has reached the stage of practical application, there remain to be considered a number of suggested proposals that, even though never adopted, indicate the trend of thought on the subject.

1. A Plan for Combined Insurance and Fire Protection

Addressing a group in Wisconsin in 1920, Donald R. Brewster outlined a plan for that State, under which forest and brush lands would be assessed a small amount per acre to cover the cost of combined fire protection and insurance (25). Subject to the exemption of small isolated tracts such as farm woodlots with limited timber growth not exposing surrounding tracts, all woodlands and "wild" areas suitable for timber growth

[10] Letter from general counsel, War Damage Corporation. 1947.

would be assessed 2 cents an acre per year. A minimum valuation of $1 per acre was suggested, although higher values up to about $50 per acre could be covered at an additional premium. It was felt that insurance rates should start at 1 percent with subsequent adjustment upon the basis of loss experience.

The fund would be handled by the State Conservation Commission and profits would be devoted to land acquisition and reforestation. State and other publicly owned lands would be exempt from assessment and from the insurance provisions of the plan, but would be included in the fire-protection districts. It was thought that by combining insurance with protection, property owners would pay the assessment for protection more readily, knowing that insurance could be collected if protection failed. The inclusion of the low-value brush lands is an interesting feature of the proposal, the purpose being to encourage reforestation through protection of soil fertility and the potentially valuable humus.

2. A Plan for Combined State and Federal Forest Insurance

Four years later, in 1924, Paul A. Herbert presented another plan for compulsory Government forest insurance at hearings of the Select Committee on Reforestation of the United States Senate, 67th Congress (42). Carrying the earlier suggestion of Brewster somewhat further, Herbert proposed that woodlands throughout the entire country (farm woodlots optional) be brought under a combined State-Federal insurance scheme. Rates commensurate with the hazards were to be promulgated by "forest actuaries" employed by the State foresters of the several States and responsible to them but required to meet standards set by the Federal Government. Premiums were to be collected by tax collectors and deposited with the State treasurers subject to withdrawal, however, upon order of the State foresters, who were to be responsible for the administration of the plan in each State. Woodlands could be valued at either market or expectation value at the option of the owner and subject to approval by the State forester.

The Federal Government was to be empowered to reinsure all risks written in the various States, provided standards satisfactory to the Secretary of Agriculture were maintained by the State funds. Reinsurance was to be written at the approximate average fire-loss rate of the respective States.

While the Clarke McNary Act of 1924, which followed and grew out of the hearings just referred to, did not provide for Government forest insurance, it did provide for Federal forest-insurance studies and these were later published in the form of Shepard's reports on the Northwest and Northeast. In the meantime emphasis was shifting to the relation between forest insurance and forest credit, and the proposals next to be considered lie in this latter field.

3. The Fletcher Bill and the Bankhead Bill

In 1935 a bill (35) introduced by Senator Fletcher of Florida proposed to create within the Farm Credit Administration the office of Forest Credit Commissioner (84). Forest-credit operations were to be financed through a forest-credit bank with a capital of $40,000,000, of which $10,000,000 was to constitute a forest-insurance fund.

Three years later, on March 14, 1938, a message to Congress from the President called attention to the Nation's forest problem and recommended a study of it by a joint committee of the Congress. A Joint Committee on Forestry, consisting of five Senators and five members of the House of Representatives, was established later the same year and was directed to investigate and report upon the forest situation, and to recommend a plan of action with effectuating legislation. Hearings were held in various parts of the country and the report was presented to Congress on March 24, 1941 (74). Recommendation 6 of this report deals with forest credits and recommends:

> "...provision for a forest credit system to make long-term, low interest rate loans to private forest and naval stores operators through facilities already available in such agencies as the Reconstruction Finance Corporation, the Farm Credit Administration, and the Federal Land Bank. These loans should be conditional upon both sound forest practice and sound investment..."

While forest insurance is not mentioned by name, it is clearly implied in the requirement that loans be "conditional upon...sound investment."

At the same session of Congress (77th Congress, 1st Session, 1941) a bill was introduced by Senator James H. Bankhead, Jr., of Alabama (chairman of the Joint Committee on Forestry), to carry out the recommendations of the Committee report (20). This bill provided for a forest-credit division to be established within the Farm Credit Administration and for the chartering of a Forest Credit Bank with a capitalization

of $40,000,000, of which 7½ million was to be available as an insurance reserve fund. The bank was to extend credit for the conservation, improvement, protection, management, and operation of forest lands and for the marketing and utilization of forest products. Borrowers would be required to meet certain standards with respect to sustained-yield forestry and woods practices. The bill required (Section 5, Title V) that borrowers provide insurance, obtained either from approved private insurance companies or from the bank itself. Insurance was to cover such hazards as the bank required. The bank was authorized to insure to the extent of its interest and property (including facilities and equipment) upon which loans were granted. Reasonable rates of premium were to be determined in accordance with the risk involved. There was provision for a deductible clause in the insurance coverage in order that small claims might be eliminated.

The credit and insurance provisions of the Bankhead Bill follow somewhat closely the recommendations of the Interbureau Coordinating Committee on Forest Credit, released in 1940 (50); and they represent the thinking of various Government units concerned with this problem. Whatever form forest insurance in this country may ultimately take, it seems likely that it will be strongly influenced by the requirements for forest credit.

4. Forest Insurance in Connection with the Federal Crop Insurance Program.

Public Law 551, passed in 1944, permitted the insurance of "timber and forests" by the Federal Crop Insurance Corporation upon an experimental basis (75). The activities of the corporation, restricted at first to wheat and later broadened to include cotton, were now further extended to allow trial insurance on any other agricultural commodities (corn, oats, rye, tobacco, rice, sugar cane, potatoes, and citrus fruit are among those listed by way of example in addition to timber) provided sufficient actuarial data were available. For trial programs in any commodity, the insurance is limited to 3 years and to 20 representative counties; moreover, such insurance was limited to corn and tobacco in 1945 and to not more than three additional commodities each year thereafter. Insurance was not to be written for more than 75 percent of the investment in the crop--just how this yardstick would be applied to timber is not specified. The hazards that may be covered are broad, the act authorizing coverage against "loss in yields due to unavoidable causes, including drought, flood, hail, wind, frost, winter-kill, lightning, fire, excessive rain, snow, wildlife, hurricane, tornado, insect infestation, plant disease and such other unavoidable causes as may be determined by the Board."

It will be noted that experimentation with the insurance of timber and other commodities is made permissive rather than mandatory, and the writer understands that forest insurance is not actively contemplated by the Federal Crop Insurance Corporation.

The Hook Bill (49), introduced in 1946 and endorsed by the International Woodworkers of America, C.I.O. (37), also provided (under Title IX) for a forest-insurance program under the direction of the Federal Crop Insurance Corporation. The FCIC would have been authorized

> "...to insure growing forests against loss or damage... on such terms and conditions as the Board may prescribe as in accordance with sound insurance practice... . Each forest insurance agreement shall require that the insured property be managed in accordance with sound forestry practices prescribed or approved by the Secretary of Agriculture. Such practices shall be designed to prevent forest destruction and deterioration and to maintain the insured property in a productive condition and, if feasible, to accomplish sustained yield management".

The Hook Bill was not passed. It is, however, illustrative of one approach to forest insurance and forest policy and of the growing pressure for sustained-yield management of commercial woodlands.

More recently the whole Federal crop insurance program was given careful study by the House Agriculture Committee on the basis of almost 10 years' experience (46). Efforts were made by the Committee to find ways of allowing private companies to underwrite part of the program with Government reinsurance to guard them against excessive losses[11]. It is some such balance between Government and private enterprise that would seem to hold the greatest promise for forest insurance in the United States.

5. Recommendations of the Forest Credit Committee

Recognizing the need for a transition from forest practice based upon exploitation of virgin resources to one based upon sustained yield, and recognizing further the important part that forest credit must play

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[11] Anonymous. Sound crop insurance. (Editorial) Phila. Eve. Bul. 101st Year (35): 14. May 16, 1947.

in that transition, the Farm Credit Administration in September 1945 appointed a small committee of persons not in Government service to make a study of the credit needs of American forestry. It was felt that an outside analysis of this kind would be helpful to legislators concerned with the problem, to the staff of the Farm Credit Administration, and to the United States Forest Service. While this group, known as the Forest Credit Committee, has issued no final report, it is understood that tentative recommendations parallel in a general way those of the Fletcher and Bankhead Bills already described, and call for the establishment of a Forest Credit Bank and in conjunction therewith a Forest Insurance Corporation to be capitalized by the Government and to be under the same direction as the Bank.

Although anticipated that the Forest Insurance Corporation would first undertake fire insurance, it should be authorized to write insurance on other types of natural hazards if and when other actuarial data are available. Loss by fire being one of the greatest single factors affecting the ability of a borrower to make repayment, the bank would require adequate insurance protection on all loans. Such insurance would not necessarily need to be purchased from the Forest Insurance Corporation, provided approved private companies stood ready to assume the risk. The fact that the private market has not provided an adequate facility in this field is regarded, however, as an indication that a Government-sponsored Forest Insurance Corporation may be needed. A Forest Insurance Corporation, while primarily interested in supplementing the operations of the bank, would also be authorized to write insurance for any owner or operator able to meet the underwriting standards set up. It is anticipated that in some areas the fire hazard is such that neither credit nor insurance would be feasible and that operations in such areas must await improved fire protection and awakened public interest.

The suggestions of the Forest Credit Committee are one more evidence of the thought being given to the subject. One may rest assured that a real need will sooner or later be met in one form or another. If the private companies are to assume a share in developing this new field of insurance, it will surely behoove them to re-examine the extent of their potential contribution before the mold has become set.

PROBLEMS OF UNDERWRITING

After this review of attempts, both actual and proposed, to deal with forest insurance in this country, some comment should be made upon some of the problems of underwriting (using that term in its broader sense) and upon the type of carrier best suited to forest insurance. It will be convenient to consider underwriting problems under the several headings of physical hazard, moral hazard, valuation, rating, forms and clauses, and production.

Physical Hazard

Is the physical hazard of forest fire so unlike that of other combustible property as to remove it altogether from the realm with which the fire-insurance underwriter is familiar? Such is not the case. The underwriter thinks of physical hazard in terms of construction, occupancy, exposure, and protection. Without too great a stretch of the imagination, the "construction" of a forest may be likened to the composition of the stand (for example, hardwoods, conifers, or mixed), the density of growth, average size of trees, and presence or absence of logging slash, snags, and other hazards of like nature (62, p. 71). The "occupancy" of a timber tract reflects its use for lumbering, fuel supply, harvesting of naval stores or other products as well as for recreation. The hazards of exposure are obviously factors of the greatest importance in the forest as they are in built-up areas. Protection, both public and private, is found in varying degrees of effectiveness.

While there are numerous points of similarity, there are two other factors that the forest underwriter must consider that are of relatively little significance in general fire insurance: topography and climate. The slope of ground affects both the rate of spread of forest fire and the ease of control; and climate is of major importance, since precipitation, relative humidity, temperature, and air movement all influence combustibility to a marked degree.

The conflagration hazard cannot, of course, be disregarded in forest underwriting any more than it can in other forms of fire insurance. This factor has been so publicized and is so prominent in the public mind, however, that it perhaps tends to overshadow the true statistical forest fire loss experience. Shepard (63, pp. 112-119) gives the conflagration hazard careful consideration; and while the serious

Tillamook fires of 1939 and 1945 occurred after the publication of his research, nevertheless his findings will remain a basis for future studies of this subject. The conflagration hazard naturally varies by area and in some sections is a relatively slight factor. Fire underwriters are aware of conflagration possibilities in all of our large cities and limit their liability through selection and reinsurance. It is contended that the forest conflagration hazard is susceptible of similar treatment.

Questions of physical hazard cannot be dealt with in general terms. Thorough and painstaking studies of specific regions are needed if forest insurance is to be successfully underwritten. However, the problems are technical ones and can be handled at the technical level by agencies already existing both in the insurance industry and in Government. Shepard's pioneer studies are of inestimable value and will point the way for future workers. The problems of physical hazard are difficult but they are hardly insurmountable.

Moral Hazard

This can be considered of two kinds, the "inside moral hazard" and the "outside moral hazard" (60). The former term refers to fires set, or claims fraudulently inflated, by the insured or other payee under the policy, with the expectation of profiting at the expense of the insurance carrier. It would be idle to maintain that woodland owners, especially during hard times, will not be subject to the same temptations as beset those in other kinds of business. At the same time there is no reason to believe that timber owners are as a group less responsible than other types of property owners. Indeed, as Shepard points out, the fly-by-night and irresponsible operator is at a disadvantage in forest enterprise because of the capital and patience required to engage in growing timber (62, p. 19). In any event, the underwriter should be able to keep this factor within bounds by applying the familiar tests of character, capacity, and credit by employing such safeguards as partial insurance to value, and by exercising ordinary underwriting judgment.

The "outside moral hazard" is perhaps more difficult to deal with because it presents certain features not encountered in the insurance of buildings and their contents. The firebug must always be reckoned with, and while such individuals are fortunately rare, they can cause great destruction before they are apprehended--they are responsible for some forest fires as they are for urban fires. In addition, however, forest properties are at times set afire by those out of employment who hope for

work on fire-suppression crews. During periods of financial depression this factor may cause real concern in certain areas and its seriousness cannot be overlooked. Of a different nature are fires set intentionally but not maliciously by persons hoping to improve or facilitate the harvesting of forest or agricultural products. Berry pickers are a case in point; fires set by them at times cause damage to adjacent woodlands. The practice of light burning in woodlands in the South has already been mentioned.

Factors of moral hazard, as of physical hazard, will vary from one region to another, but here again would seem to represent difficulties to be solved rather than insuperable barriers to forest underwriting. Education and law enforcement have their place in reducing moral hazard, and deserve the support of insurance interests.

Valuation

What is the sound value of a stand of timber at time of loss and how does this compare with the salvage value following a fire? The answers to these questions are not easy to find and this difficulty has undoubtedly played a part in discouraging underwriters from giving forest insurance the attention it deserves.

Forests, as has been said, are growing and changing communities of living organisms and cannot be valued as would buildings and their contents, raw materials, or manufactured products. Moreover, woodlands may vary markedly even within a given tract, not only as to density and composition, but also as to age classes and in other ways. The valuation of merchantable timber commanding a market value for immediate conversion is clearly a very different proposition from the valuation of young growth or reproduction, the worth of which is dependent upon its future utility many years hence. The physical considerations of location and extent also set forest properties apart as peculiarly difficult to value satisfactorily. Standing timber can hardly be regarded as a liquid asset, and there is often no active market to assist in verifying insurable values--although this is something that improved forest-credit facilities should do much to overcome.

Since the problem of forest valuation affects both the underwriter and the loss adjuster, consider the situation both at inception of the policy and at time of loss. As will be observed from the policy form

recommended by Shepard and given as Appendix, Exhibit B, an amount of insurance is specified for each of four items: merchantable timber of sawtimber size, merchantable timber of cordwood size, timber of unmerchantable size, and plantations. In deciding whether the amounts applied for are in line with actual cash values and not so excessive as to create a moral hazard, the underwriter will have in mind a general idea of timber values based upon his underwriting experience and will, in addition, have a signed application warranting the assured's valuation by item (as above) and stating the average size of trees, the density per acre in board feet, and the value by species. Assuming the applicant to be trustworthy and competent, this information will furnish a basis for forming an intelligent judgment both as to the desirability of the risk and the reasonableness of the amount of insurance requested.

While an underwriting inspection of the property prior to acceptance of the risk is always a possibility, the expense involved will rule out this method in most cases. It is interesting to note that the Timberlands Company found the cost of inspection prohibitive and preferred to rely upon the owner's valuation (28). In addition to the warranty in the application, the form itself contains a number of safeguards. Thus, it states that "in no event shall this policy be liable for more than $-------- per acre; nor more than $ -------- per M. board feet; nor more than $ ------- per cord." Again, a pro-rata distribution clause provides that insurance shall attach to each acre in the proportion that the value of each bears to the value of the whole property, quality and density of stand, and logging facility considered. A three-fourths loss clause discourages overinsurance, while a coinsurance requirement discourages underinsurance.

While correct valuation at inception of the policy is important, the question of valuation becomes paramount at time of loss. The form proposed by Shepard provides that the company "shall be liable in case of loss, only for the difference between the value of the standing timber or plantation trees before the fire and the salvage value of the said timber or trees immediately after the fire." Following loss, then, one must ascertain (1) the sound value before the fire and (2) the extent of depreciation or salvage value following the fire. In losses of any size, carriers will need to utilize the services of adjusters with forestry and lumbering training and experience, just as difficult adjustments call for expert handling in other lines of insurance. As realized following the Timberlands experiment, the development of forest insurance will call for professionally equipped "forest actuaries" and it is unlikely that such training will not be made available once the need has been recognized.

Under some circumstances it may be feasible to write forest insurance upon a valued basis--especially in the case of plantations or stands of uniform value and composition. When this is done a fixed value per acre is agreed upon at inception of the contract and this sum is then paid in case of total loss with partial losses calculated upon the basis of percentage of depreciation. Valued policies, while little used in fire insurance, are the rule in ocean-marine and some forms of inland-marine insurance and may supply the answer for certain types of standing timber coverage. A valued policy shifts the burden of valuation from time of loss to inception of the policy but does not eliminate the need for accurate determination of sound value itself.

The actual survey or appraisal may call for a timber "cruise" of the area burned to determine the timber volume in board feet, cords, or by the acre and to arrive at a percentage of depreciation based upon salvage remaining and its market value. Shepard, in discussing this problem (62, p. 31), points out that the unit value in board feet or acres can in some cases be arrived at by agreement between underwriter and assured pending determination of actual extent of damage, while in other cases this must await completion of the appraisal. The usual provision for arbitration in case of failure to reach agreement will of course be contained in the standard policy to which the timber form is attached.

Shepard discusses in some detail the questions that arise in valuing merchantable timber; he shows that the interest of the insured will vary depending upon his being an operating or nonoperating owner just as the insurable value of merchandise will vary as between manufacturer, wholesaler, and retailer (62, p. 26). Nonmerchantable timber, including reproduction and plantations, will require still different methods of valuation. The Harvard Forest study (17, p. 40) points out that one of three bases may be used in arriving at a value for unmerchantable growth: (1) present market value, (2) cost of production (including carrying charges) up to time of damage, and (3) expectation value--the estimated future value discounted at compound interest back to the time of loss.

European experience demonstrates that problems of forest insurance valuation can be worked out. The field of forest economics in general and of forest valuation in particular is receiving constant study and with the collaboration of insurance interests should be able to produce answers suited to insurance requirements for this country.

Rating

"The problem of rates is at once the most important and the most complex and difficult of all that confront the insurance carrier. More than any other it calls for a distinct and different solution for each kind of insurance" (55).

Forest insurance is no exception to this rule. The rating problem has, as might be expected, already received a good deal of thought on the part of those interested in timber coverage. Thus, as early as 1920, Sparhawk, writing in the Journal of Forestry (68), sought to apply the Experience Grading and Rating Schedule, a schedule rating based upon statistical experience. The damage caused by forest fire, he stated, depends upon the three factors of area burned over, value per acre, and proportion of value destroyed. The basic factors are in turn subdivided into their component parts. The United States would be divided into twenty to thirty regions by forest types and climatic conditions, with regional subclasses for age group, comparative inflammability, "suppression availability", and so forth. A central actuarial bureau was proposed to collect forest-fire statistics upon the basis of the classification decided upon.

A few years later Stickel (70) made some interesting suggestions for proposed changes in the method of collecting forest-fire statistics in respect to their usefulness in insurance rate-making. He agreed with Sparhawk in favoring use of schedules based upon experience as opposed to judgment schedules such as the analytic or universal mercantile, especially since judgment rates are difficult to formulate in a new field. Stickel believed that estimates of monetary damage (apt to be unreliable unless very carefully prepared) be eliminated and that instead a figure be reported representing percentage of standing timber killed. By use of tables showing the relationship of percentage of trees killed to values destroyed for various types of stand, a more accurate loss estimate could be obtained. Stickel recognized that changes in methods of collecting forest-fire statistics are limited by character of personnel and funds available but emphasized that schedule rating based upon experience can be obtained only if properly classified statistics are available.

The United States Chamber of Commerce Report on Forest Fire Insurance (1927) recognized the rating problem as secondary only to that of demand (66). The second recommendation of the report (the first had urged that immediate steps be taken to learn the extent of interest in forest insurance on the part of timber owners) proposed that once a

demand had been made known, a thorough study of the essential factors in forest insurance be undertaken in order that a scientific rate structure could be developed.

In Herbert's Michigan study (44), published in 1928, an attempt is made to work out rate schedules based upon judgment factors substantiated by such statistical or other evidence as was available. One schedule, prepared for the Senate Committee on Reforestation (67th Congress) shows rates designed for use in the Lake States provided all forest property were insured by the Government. A basic charge of 25 cents per hundred is subject to various flat increases and credits producing a maximum rate of 95 cents, a minimum rate of 7 cents and an average rate of 55 cents. In addition, a schedule for the use of commercial companies writing standing timber in Michigan is presented having a base rate of 75 cents per hundred. It was believed that this schedule erred on the conservative side and that rates could be reduced as experience became available. This early attempt to devise a forest-insurance rate schedule contrasts markedly with the class rates used by the Timberlands Company a decade previously.

Five years later the Harvard Forest published its study of six representative forest properties comprising a total area of approximately 8,000 acres in Worcester and Franklin Counties, Mass. (17). This study, while limited in scope, is of interest as being the first intensive analysis of its kind. The properties were studied as to character of the timber stand, topography, fire history over a 15-year period, fire hazards, protection facilities, and loss cost. On only two of the six properties did fire cause any damage during the period (1916-30), while the pure loss cost for these properties was 12.5 cents and 1 cent per hundred respectively. The report concludes:

> "These figures indicate that with a large volume of business, fire insurance can be offered to owners of timberlands in north central Massachusetts at very low rates. Thus the present study disproves, for this region at least, the conviction generally held by underwriters that timberlands in the aggregate are subject to unusually high loss costs and to such high fire risks that insurance is impossible"(17, p. 76).

The Harvard study formulated a tentative "Grading and Rating Schedule for the North Central Part of Massachusetts" as follows:

Class of risk	Range of rates	Average rate for class
Low	Up to $0.15	$0.15
Mild	$0.15 to .20	.18
Average	.20 to .30	.25
High	.30 to .75	.55
Serious	.75 to 2.00	1.40

The next milestone is the study by Shepard, then senior forest economist with the Forest Service, of the rate structure required by the forest conditions of the Pacific Coast States (62). Intensive study and research extending over a period of several years was devoted to the development of a rating schedule for this area--estimated to contain perhaps two-thirds of the privately owned timber of merchantable size in the entire country. Reports of local fire wardens and rangers for the years 1921-30 were analysed (data for the years prior to 1920 were considered less reliable and were used to a limited extent only) and were supplemented by actual field surveys or timber cruises in various areas. The latter were stated to be comparable in every respect with surveys that would be carried out in connection with loss adjustments had the properties actually been insured. Weighing the "causative hazards," the "contributive hazards," the influence of climate, and factors of protection a statistically ascertained normal loss expectation for the territory as a whole is reached; it amounts to 8.2 cents per $100 of value. This figure is broken down as follows for the forest regions into which the Pacific Coast study was divided.

	Cents
Douglas-fir region	4.7
Northern ponderosa pine region	11.9
Sugar pine-ponderosa pine region	13.3

A rate schedule is then derived for each of the three regions, following the pattern of the Universal Mercantile Schedule. The rates proposed were intended for use during the introductory phase of forest insurance underwriting and were to be subject to revision as experience developed. An aggregate average 100 percent coinsurance rate of 45 cents per $100

of value is suggested for the territory as a whole, assuming all privately owned forest property were insured. This figure is distributed as outlined below:

	Cents
Douglas-fir region	0.50
Northern ponderosa pine region	.40
Sugar pine-ponderosa pine region	.35

This spread between the pure loss cost and the average rate is accounted for by loadings for conflagration hazard, moral hazard, expense, profit, errors in computation, and general contingencies. Shepard estimates the above rates to be adequate for a premium volume from $150,000 to $300,000 per year, with reductions possible if premiums amounted to more than the latter figure. Assuming that 75 percent insurance to value were carried, and that the total insurable value of the area is $650,000,000, it appears that at a rate of 50 cents, insurance of roughly 7 percent of total value would produce a premium volume in excess of the $150,000 minimum needed to justify the rate levels advocated (63).

The study of the Northeastern States, also by Shepard (64), appeared in 1939, 2 years after his earlier bulletin. Here again, 10 years fire experience was analysed and was supplemented by field work. The project covered the New England and Middle Atlantic States[12] with particular attention to Maine, New Hampshire, Vermont, Massachusetts, New York, and Pennsylvania. A normal loss expectation for the territory as a whole was found to be 13.5 cents per $100 of value, distributed by subregions as follows:

	Cents
Northern forest	6.4
Northeastern white pine	8.8
Northeastern oak	27.3
Allegheny hardwoods	17.4

The bulletin contains a map showing the location of these four regions.

[12] Insurable timber values in this area were estimated to be $593,000,000.

Expense and safety factors are added to the pure loss cost and local base rates developed in accordance with a town and country classification system for use under a rate schedule of the universal mercantile type. Base rates are stated to vary between $0.17 and $1.73 with by far the greater number of towns in the lower rated classifications. The average rate that the schedule is intended to produce for the territory as a whole is apparently in the neighborhood of 54 cents.

Forest insurance actually being written today--and it is negligible in amount--would appear to be carrying much higher rates than those referred to above. As we have seen, the rates asked by one company accepting timber risks start with a base rate of $1.25 and the final rate seems likely to approach 2 percent in many cases. It must be remembered that this rate scale applies only to the one section of the country in which risks are accepted by the company. Upon inquiry by the writer, one broker stated that a request for forest insurance "along the street" might result in a quotation of from 3.5 percent to 7.5 percent, another estimated 2 percent to 10 percent, and still a third believed that very few risks could be placed under 5 percent. It is apparent that these quotations reflect lack of spread rather than the true loss experience. It is equally apparent that forest insurance will not move forward so long as such rates persist.

The time has come when the rating problem should be attacked with renewed vigor. The 10-year data that Shepard had to work with in the early 1930's are now available for a period of 25 years, and the original conclusions can well be re-examined in the light of the additional experience. Just as pioneer efforts in any field are subject to later simplification and refinement, it may well be that Shepard's schedules can be improved upon as the subject becomes better explored. Moreover, studies should be initiated for the other important forest regions--the South and Middle West.

To postpone rate studies until demand has crystallized (as suggested by the Chamber of Commerce report) is not sufficient for two reasons. First, demand is itself a function of the rate; as lower rates are promulgated demand may be expected to increase. Second, recommendations are needed for improved fire statistics that will lend themselves to experience rate-making. The insurance business is in the best position to initiate steps in this direction.

Forms And Clauses

Reference has already been made to the policy form in use in the Northeast (Appendix, Exhibit A) and also to the form developed by Shepard (Appendix, Exhibit B). While it is not believed that the drafting of suitable policy conditions presents any particular difficulties to forest-insurance underwriting, nevertheless it will be of interest to mention three clauses that have special application to timber risks.

The dry-season clause reflects the increased hazard to which forests are exposed during the months of the year in which rainfall is light. In order that coverage cannot be taken out for the hazardous period only at the usual short rate of annual cost, the clause allocates 80 percent of the year's premium to the dry season (as defined in the form as March to November, or April to October, etc.) with the provision that in case of cancellation by the assured the return premium shall be calculated at the customary short rate of the difference between the dry-season charge and the full premium. Somewhat similar provisions are found in other coverages in which the hazard is unevenly distributed throughout the year.

The humidity warranty quoted in Shepard's Pacific Coast study (62, p. 132) has been adapted from one in use on felled-timber risks in the Northwest. The clause warrants that all logging operations on the insured property will be suspended during the dry season when and so long as relative humidity falls below 30 percent, and further that instruments necessary to determine relative humidity will be maintained and that adequate records of humidity conditions will be kept. Relative humidity has been extensively used as an index of fire danger in certain areas, and logging operations are contrary to law in some States when humidity falls below a certain figure.[13]

The clause authorizing delayed loss adjustment is an unusual one. It reads in part as follows, "...in event of loss, this company shall not be required to accept proof of loss nor to make payment of indemnity, unless it so elects, prior to December 1 of the year next following the year of the date of said loss..." The time limit for commencing suit

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[13] Recent improvements in rating fire danger suggest that some other factor might be substituted for relative humidity, such as the "fire-danger class" or the "burning index."

under the policy is extended accordingly. This need for delayed adjustment arises from the fact that fire damage may not be apparent at once and it may not be until the end of the following growing season that the extent of damage can be determined.

Production

The selling, or marketing, phase of forest insurance is a difficult one that relates back to the question of demand. Absentee ownership, coupled with the specialized nature of timber insurance, makes it hard to sell this form of coverage through the usual production channels of the fire-insurance business.

It would seem that production plans must await completion of the demand survey recommended above. Once the potential market has been analysed, there should be little difficulty in bringing to it the advantages that insurance has to offer. In this connection it is suggested that the possibilities of group coverage not be overlooked--either as a means of securing a wide spread of risk or as a means of placing business on the books at a reasonable acquisition cost. Among groups that could be approached are forest products cooperatives, a type of forest enterprise that has been receiving increasing attention in recent years (22), tree-farm groups now organized in a number of States (12), and trade associations--pulp, lumber, or more specialized ones such as naval-stores operations.

Under none of the six headings into which the problems of underwriting have been grouped is there any evidence that forest insurance is incapable of practical solution from the "supply" side.

TYPE OF INSURER

What type of carrier is best suited to undertake forest insurance in the United States? It can hardly be claimed that one type is inherently better equipped to insure standing timber than another. Forest insurance has been written by a mutual company in Norway, by stock companies in Sweden, and by government agencies in Germany and Japan.

In the United States, each of the four types of private insurer has, at one time or another, shown some interest in forest insurance. The pioneer attempt to write forest insurance, by the Timberlands Company, was organized along mutual lines. Mutual companies were represented upon the committee that prepared the Chamber of Commerce report of 1927; and for a time, at least, the Associated Lumber Mutuals maintained a committee on timber insurance (51).

Stock companies have taken some part in forest insurance since the subject first attracted attention in the United States; and in addition to the companies now accepting such risks, occasional lines have been written by others. Stock companies participated in the United States Chamber of Commerce report and have supported the work of the National Fire Protection Association in this field.

Lloyds of London is known to have accepted reinsurance of timber risks from time to time, and as early as 1911 wrote a sizable line on Canadian spruce to secure a $5,000,000 bond issue of Price Brothers, Ltd., of Quebec (54). The area covered was divided into blocks of roughly 300 square miles separated by natural barriers such as rivers and mountain ranges, and the policy covered $250,000 excess of $75,000 in a given block at a premium of 0.25 per cent.

The reciprocal or interinsurance exchange has been suggested as a suitable vehicle for forest insurance (26), while proposals for various types of Government insurance have already been outlined in some detail.

Who, then, are the best carriers to undertake forest insurance? As respects the 5 percent of forest enterprise regarded as ripe for commercial insurance development, it seems that the stock companies are the logical choice--first because their size and strength enable them to assume the liabilities involved, second because they are operating in a large number of States and so can accept risks throughout the country. A pool or syndicate of stock companies would be a logical approach and one that has ample precedent within the business. In this way liability is distributed so that no one company is exposed to more than a fixed percentage of any given loss. The Logging Pool set up a number of years ago to insure felled timber and logging equipment on the West Coast (32) has been suggested as a possible point of departure.

The balance of the timber market does not seem ready for commercial insurance at this time because of absence of intensive forest management. Government, then, must assume the initiative in this area and seems more than likely to do so--probably in a form embracing forest credit as well. Owners not qualifying for commercial coverage could thus obtain a limited form of protection in connection with long-term, low-interest borrowing.

Rather than attempting to maintain a watertight separation between the commercial and noncommercial divisions of the subject, it is suggested that there be the closest cooperation on the part of business and Government in working out their mutual problems. Government could assist private companies by providing catastrophe reinsurance, as has been suggested for the crop-insurance program; while the private carriers could contribute their facilities and practical experience in helping the Government to handle the "social" need. The example of the War Damage Insurance program offers a possible solution. The private companies, it will be recalled, acted as fiduciary agents for the War Damage Corporation, retaining 3.5 percent of premiums collected (subject to a stated minimum and maximum per policy) and in addition shared to the extent of 10 percent in profits or losses in excess of net premium less expenses with a maximum aggregate profit or loss to all companies combined of $20 million (9).

The precise form that cooperative Government and private underwriting might take is perhaps less important for present purposes than the principle itself. The point is this: the joint efforts of business and Government should be able, and without a doubt are able, to find an adequate solution to the problem. It is doubtless true that suggestions for joint action on the part of public and private enterprise in peacetime will be looked upon as novel by some and as heretical by others. Be that as it may, if the War Damage Insurance plan was regarded as "a shining example of Government and industry working in harmony for the common good" (11) is it too much to expect that this country can be sufficiently resourceful to meet the problems of peace in the same broad-gage way?

CONCLUSIONS AND RECOMMENDATIONS

Findings have been summarized in the form of answers to the six questions posed in the introduction.

1. Is there a real need for forest insurance? The answer is "yes". On the one hand, timber owners who operate their woodlands under conditions of intensive management have the same need for insurance as do those in other forms of commercial enterprise; this is called the business or commercial need. At the same time, there is a social need for forest insurance (along with forest credit) as a means of removing at least some of the economic barriers to sustained-yield forest management. The latter, in turn, helps to assure future supplies of saw timber, pulpwood, and forest byproducts. In addition, sustained-yield management is a step toward the stabilization of industry and employment in a not inconsiderable segment of our economic life, while the conservation of soil, water, wildlife, and recreation values resulting from sustained-yield management is likewise a consideration of the greatest importance.

2. Why has forest insurance made so little progress in this country? Two basic reasons may be assigned. First, the need for this form of insurance has grown slowly and has only to a limited extent been translated into an effective demand. The absence of demand in turn has been attributed either to high rates or to lack of sales promotion. Although these factors have played a part, it would appear that the relatively undeveloped state of forest management has been more fundamentally responsible. Second, on the supply side, forest insurance has commanded comparatively little interest on the part of the commercial insurance business. It is true that there have been practical difficulties that are not to be underestimated, but it does nevertheless appear that underwriters have allowed unfamiliarity with a new field to stand in the way of their taking advantage of such demand that could be created. They have perhaps not fully recognized trends that are working in their favor.

3. Do former obstacles still exist; if so, to what extent can they be removed? Of course demand must be present before insurance can be written commercially. To the extent that lack of sales promotion is at fault, it can be overcome by concerted action once there is assurance that the underlying conditions are favorable. High rates, in so far as they result from narrow spread of risk, can likewise be overcome, since the securing of a balanced book of business will permit rate levels to be based upon statistically ascertained loss experience. High rates as a reflection of inherent hazard are of course a different matter, but even here improved fire protection, both in extent and in intensity, is bringing about an improving fire-loss record. Besides, in certain areas the hazard is now

and has been for some time well within the requirements of sound underwriting.

The character of timber cutting is progressing year by year along the road leading from destructive practices to a higher order of cutting and to sustained-yield operations. As this change takes place, whether it comes from the exigencies of timber needs or from legislative requirement, forest insurance will become an increasingly necessary tool. The precise point along this road at which forest insurance becomes commercially practicable is of course a question of business judgment. Indeed, there may be many such points, depending upon the various forest areas of the country, and in some, at least, forest insurance is already ripe for promotion.

On the supply side of the picture, the obstacles have been in part technical ones such as rate and valuation. These problems can be solved on the technical level. The problem of interesting underwriting circles in the field as a whole is one that lies within their own power to resolve when the opportunities inherent in it are appreciated.

4. Is standing timber under existing conditions an insurable risk? This question can hardly be answered in a single word. The experience of Scandinavia shows that standing timber can be an insurable risk. In the United States today there are individual risks that qualify for insurance in respect to both protection and cutting practice--just as there are those that do not so qualify. It must be the joint task of timber owners, foresters, the Government, and the insurance business to determine the location and extent of both the commercial and noncommercial markets and to work out practical means of meeting their needs.

5. What type of carrier is best suited to undertake forest insurance? While no one type of insurer is inherently better equipped to write forest insurance than another, of the private carriers it is the stock companies that would seem to be in the best position to provide this facility in the United States. In addition, Government action will almost certainly be required if risks not eligible for commercial insurance are to be covered. The extent to which cooperation between private enterprise and public enterprise in research and in underwriting may be feasible remains to be seen, but it is suggested that joint action should not be ruled out without a trial.

6. What practical steps can be taken at this time to place forest insurance upon a working basis? The consideration of this question leads to the point of specific recommendation.

First, it is suggested that a conference be called at which representatives of timber owners, professional foresters, the State and Federal forestry services, and underwriting interests, together with other concerned groups, can consider the subject of forest insurance as a whole. In a sense this meeting would begin where the United States Chamber of Commerce group stopped in 1927. There would be a difference, however, in that the group here proposed would have a broader base and would seek to include all major groups that are in a position to contribute to the solution of the problem. It is suggested that the initiative in calling such a meeting be taken by the insurance companies themselves. It is interesting to recall in this connection that in Sweden, after a number of efforts to establish forest insurance had failed, success was finally achieved following study by the Swedish Fire Tariff Association in consultation with others (71). If the private companies are to share in developing forest insurance, they must be willing to take the lead. The opportunity for private carriers to play a part may not continue for an indefinite period and if they wish to act it would seem desirable to move forward without undue delay.

Second, it is recommended that the conference just proposed set up a continuing committee to make arrangements for exploring aspects of the subject that require further study. Of these the question of demand is paramount. As already suggested the Federal Government could be requested to sample demand through a survey designed to find out what forest insurance protection is worth to woodland owners. The Society of American Foresters or forestry schools could be asked to initiate studies of forest valuation as it bears upon the needs of a practical insurance program. The various fire-insurance-rating organizations could be asked to formulate rate schedules and suggestions for the collection of fire-loss statistics to become the basis of an experience rating system. The relation of forest insurance to forest credit is already receiving attention.

Third, upon the basis of the committee's findings, it is recommended (1) that private companies set up an underwriting pool or syndicate, or utilize existing agencies, to write commercial forest insurance in such areas that are ready for it, and (2) that joint Government-private underwriting be undertaken as a means of meeting the needs of those who do not qualify for commercial coverage.

Standing timber has been referred to as one of the five great values in the country and the only one of these that has been uninsurable in the past (53, p. 427). A recent writer [14] states that,

> "...timber production, as a business entity, and forest products industries as secondary enterprises occupy a unique position in the business world. In no other major industry is the whole enterprise uninsured as is the case with uninsured timberlands in the hands of an owner who sells stumpage; and in no other major industry is the whole available source of raw materials subject to destruction without possibility of recuperation, as is the case with an uninsured source of supply of a forest products manufacturer."

This need for insurance protection must be met sooner or later. Both business and government have a contribution to make in eliminating the risks of forest enterprise. When they succeed in working out a practical means of doing so, a step forward will have been taken in an important part of the Nation's economy.

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APPENDIX

EXHIBIT A:

(Sample form)
MERCHANTABLE STANDING TIMBER INSURANCE[17]

$----------On merchantable standing timber of the following varieties (and no others)----------

---

---

situate on his lot of----------acres, the boundaries of said lot being as follows:----------

----------in the Town of----------County of----------

State of ----------

The term "standing merchantable timber" shall be construed to mean living trees of six inch, or greater, diameter, at four and one-half feet above the ground, and free from dryrot and other seen or unseen defects.

This policy does not cover timber growing in such locations as to render it impracticable or impossible to log same at usual profit by ordinary and customary methods, and does not cover such timber or any species or varieties of timber or growth on property other than that above described.

It is further understood and agreed that this Company shall be liable in case of loss if any, only for the difference between the value of the standing merchantable timber before the fire and the salvage value of the said merchantable timber immediately after said fire.

---

[17]The Home Insurance Company.

It is understood and agreed that the premium rate named in this policy includes a charge equal to eighty per cent. of the annual premium for the additional hazard incurred during the dry season, and it is part of the consideration of this policy, and the basis upon which rate is fixed that in case of cancellation by the assured the return premium shall be calculated at the customary short rates of the difference between the dry season charge and the full premium charged.

It is understood and agreed that the dry season hereinabove referred to shall be any part of the months of April, May, June, July, August, September, October and November.

It is understood and agreed and made a condition of this policy that if cutting be commenced or continued on any of these lands, or any portable or permanent mill be or become erected on the premises without consent of this Company endorsed hereon, this policy shall cease to cover and shall be null and void.

It is further understood and agreed that the assured by acceptance of this policy declares the several statements and declarations in his application for insurance hereby made a part hereof, to be true, and this policy is issued upon such statements and in consideration of the premium as in this policy provided.

It is understood and agreed that this policy shall not be liable for more than $----------per acre of standing timber.

Reduced Rate Contribution Clause:-In consideration of the reduced rate and/or form under which this policy is written, it is expressly stipulated and made a condition of this contract that in the event of loss this Company shall be liable for no greater proportion thereof than the amount hereby insured bears to ninety (90) per cent. of the actual cash value of the property described herein at the time when such loss shall happen, nor for more than the proportion which this policy bears to the total insurance thereon.

Attached to and forming part of Policy No.----------

----------Agent.

EXHIBIT B:

(Sample form)

FOREST PROPERTY INSURANCE - NORTHEASTERN STATES[18]

$_____. On standing timber of saw-timber size and of the following species (and no others)_____

_____

$_____. On standing hardwood timber of cordwood size and of the following species (and no others)_____

_____

$_____. On standing timber of unmerchantable size and of the following species (and no others)_____

_____

$_____. On plantation of living trees of the following species (and no others)_____ situated on (his) (her) (their) property of _____acres, located as follows:_____

_____

in the county of_____, State of_____

The term "timber of saw-timber size" shall be construed to mean, in the case of softwood species, such portions of living trees of 6-inch or greater diameter at 4 1/2 feet above the ground and in the case of hardwood species, such portions of living trees of 10-inch or greater diameter at 4 1/2 feet above the ground as are sufficiently free from all decay and other seen or unseen defects as to possess market value, unless otherwise noted hereon.

The term "timber of cordwood size" shall be construed to mean such portions of living trees of hardwood species of 3-inch or greater diameter at 4 1/2 feet above the ground but of less than 10-inch as are sufficiently free from all decay or other seen or unseen defects as to possess market value, unless otherwise noted hereon.

The term "timber of unmerchantable size" shall be construed to mean living trees of hardwood species of 3 feet or greater height but not exceeding 3 inches in diameter of 4 1/2 feet above the ground and living trees of softwood species of 1 foot or greater height but not exceeding 6 inches in diameter at 4 1/2 feet above the ground and sufficiently free from decay or other seen or unseen defects as to possess a potential market value, unless otherwise noted hereon.

The term"plantation" shall be construed to mean living trees planted artificially, as distinguished from reproduction or second growth which has come in from natural seeding without personal supervision and planting.

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[18]Shepard, H. B. Forest fire insurance in the Northeastern States. U. S. Dept. Agr. Tech. Bul. 651. 1939.

This policy does not cover any species or varieties of timber or growth other than that above described.

It is understood and agreed that this company shall be liable, in case of loss, only for the difference between the value of the standing timber or plantation trees before the fire and the salvage value of the said timber or trees immediately after the fire.

It is understood and agreed that the premium rate named in this policy includes a charge equal to eighty percent (80%) of the annual preium for the additional hazard incurred during the dry season, and it is a part of the consideration of this policy, and the basis upon which the rate is fixed, that in case of cancellation by the assured the return premium shall be calculated at the customary short rates of the difference between the dry-season charge and the full premium charge.

It is understood and agreed that the dry season hereinabove referred to shall be any part of the months of March, April, May, June, July, August, September, October, and November.

It is understood and agreed and made a condition of this policy that if cutting be commenced on or within one-half mile of any of these lands, or any portable or permanent mill be or become erected on the premises, or within one half mile of any part thereof, or if the hazard be increased in any manner, without consent of this company, endorsed hereon, this policy shall cease to cover and shall be null and void.

Attached to and forming part of policy No._____of the _____ _____Company. Agency at _____. Dated_____ 19____.

The provisions printed on the back of this form are hereby referred to and made a part hereof.

_____

Agent

(Reverse of form)

It is further understood and agreed that the written application for the within insurance signed by the insured and dated _____ is hereby referred to and made a part of this policy, and said insured warrants that each and all of the answers made in said application are true to his best knowledge and belief and agrees that if any of said answers be known by him to be untrue this insurance shall be null and void.

It is understood and agreed that in event of loss, this insurance shall attach to each and every acre of the property described herein, in the exact proportion that the value of each acre shall bear to the value of the whole property at the time of the fire, quality and density of stand, and logging facility considered.

In no event shall this policy be liable for more than $_____ per acre, nor more than $_____per M. bd. ft., nor more than $_____per cord.

It is understood and agreed that, in event of loss, this company shall not be required to accept proof of loss nor to make payment of indemnity, unless it so elects, prior to December 1 of the year next following the year of the date of said loss nor shall this company, in the event, be liable under this policy for payment of losses less than $____ in the aggregate of actual value of property insured hereunder.

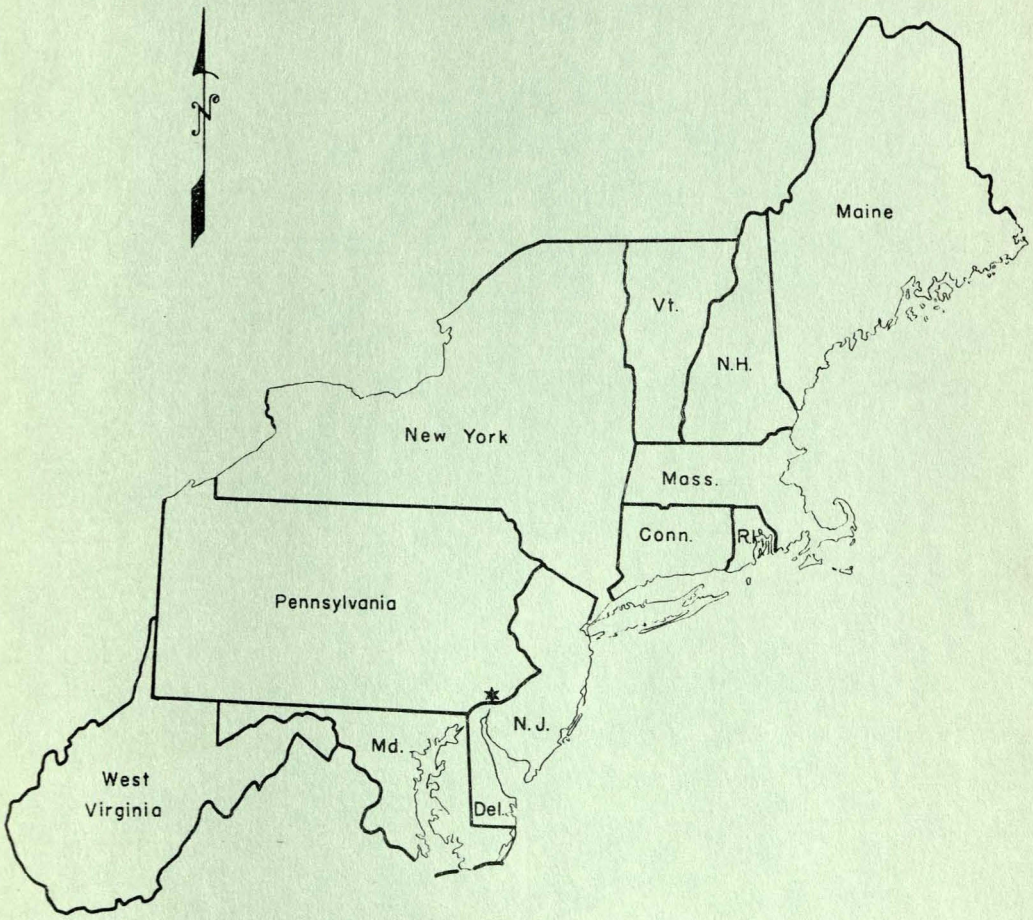
The time during which suit or action on this policy, for the recovery of any claim may be commenced is hereby extended to the end of the thirtieth month next after the date of the fire.

Loss, if any, under this policy, shall be payable to_____ _____ mortgagee, as interest may appear.

Reduced rate average clause.--In consideration of the reduced rate and premium at which, and the form under which this policy is written, with special reference to the three-quarter loss clause, it is stipulated and made a condition of the contract that, in the event of loss, this company shall be liable for no greater proportion of three-quarters of such loss than the amount hereby insured bears to seventy-five percent (75%) of the actual value described herein at the time when such loss shall happen.

Three-quarter loss clause.--It is understood and agreed to be a condition of this insurance that in the event of loss or damage under this policy, this company shall not be liable for an amount greater than three-fourths of such loss (not exceeding the sum insured) and, in the event of additional insurance permitted hereon, then this company shall not be liable for an amount greater than its proportion of three-fourths of such loss; in both events the other one-fourth to be borne by the insured.

_____,
Agent



TERRITORY SERVED
by the
NORTHEASTERN FOREST
EXPERIMENT STATION

UPPER DARBY, PA.